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ONTARIO MINISTRY OF ENVIRONMENT
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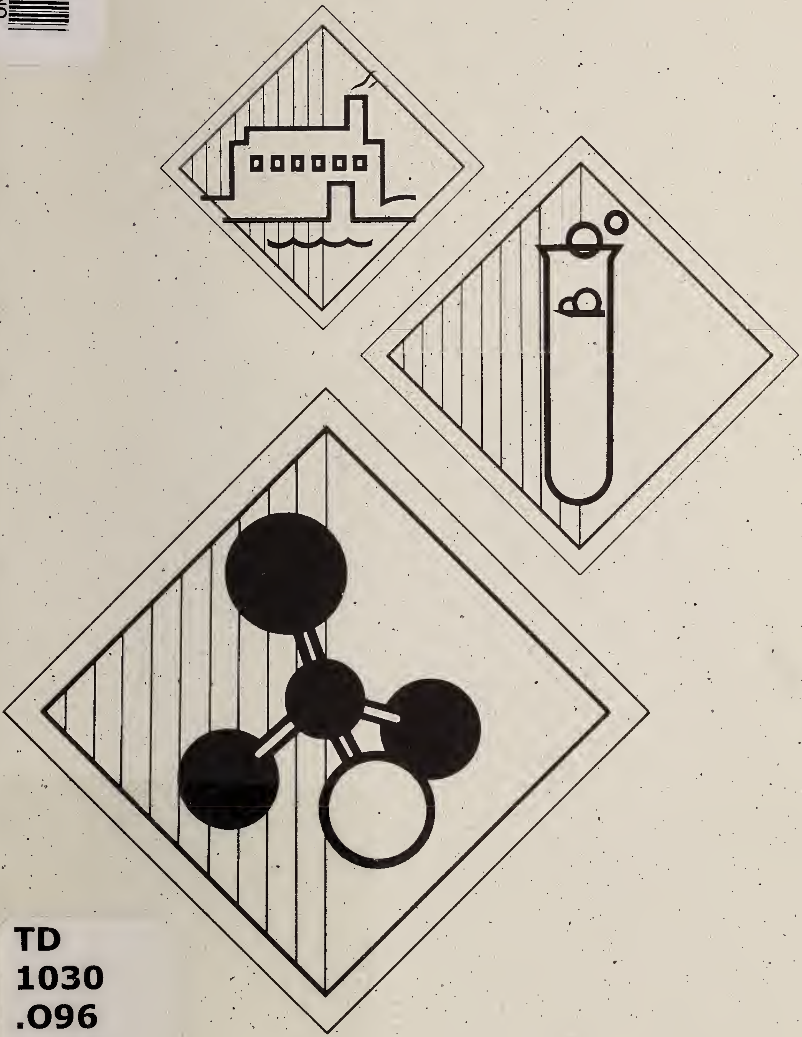
OWMC
Guide to Hazardous Waste
Terminology



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HAZARDOUS WASTE REDUCTION
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OWMC guide to hazardous waste terminology.

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The OWMC Guide to Hazardous Waste Terminology

OWMC is grateful to William M. Glenn of William M. Glenn Environmental Consultants for his skills in consolidating the information in *The OWMC Guide to Hazardous Waste Terminology* and then writing and editing the final document.

The OWMC Guide is based, in part, on: *A Glossary of Technical terms for OWMC's Environmental Assessment Hearing (January, 1990); A Glossary of Hazardous Waste Management (1989); A Reporter's Guide to the Chemicals in Today's Headlines (OWMC, 1989);* and *A Reporter's Guide to Hazardous Waste Management Technologies (OWMC, 1990).*

The OWMC Guide to Hazardous Waste Management was produced and designed by Peter Kenter; cover illustrations by Amanda Duffy/Rat Under Paper.

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INTRODUCTION

The Ontario Waste Management Corporation (OWMC) has published *The OWMC Guide to Hazardous Waste Terminology* to quickly answer many of your questions about hazardous wastes, toxic chemicals and their proper management, treatment and disposal.

The *Guide* continues an OWMC tradition of publishing concise and easy-to-understand information. Three titles in the former OWMC Press Guide Series were updated and combined to form *The OWMC Guide to Hazardous Waste Terminology*.

A Glossary of Hazardous Waste Management defined many of the technical terms used in the environmental assessment documents prepared in support of the OWMC proposal to build an integrated hazardous waste treatment and disposal facility in southern Ontario.

A Reporter's Guide to the Chemicals in Today's Headlines contained capsule descriptions of more than one hundred of the most dangerous or toxic compounds commonly encountered in Canadian commerce. Each entry included the chemical formula and possible synonyms, usage information, short- and long-term health effects, and potential fires, spill and explosion hazards.

A Reporter's Guide to Hazardous Waste Management Technologies covered some eighty proven or promising systems that can be used to reduce, treat or destroy hazardous and liquid industrial wastes, as well as clean up contaminated groundwater or soils. The booklet provided a short technical description of each process, the types of waste it can safely handle, and its commercial availability.

The OWMC Guide to Hazardous Waste Terminology was thoroughly reviewed and updated by an OWMC technical review committee with extensive experience in modern waste management. While OWMC is confident that the information is current and correct, there is not enough room in this slim volume to be comprehensive. If you require additional background information, contact OWMC at the address below.

Finally, if you have any comments or suggestions on this publication, please contact:

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A

Abandoned Site

An inactive hazardous waste disposal or storage facility which cannot be easily traced to a specific owner; or whose owner has gone bankrupt and subsequently cannot afford the cost of clean-up; or a location where illegal dumping has taken place; or a site of previous activity which resulted in contamination.

Abate

See Organophosphates.

Above-Ground Storage

Description: Above-ground, retrievable storage systems provide either short or long-term security for wastes prior to recycling, treatment or destruction. Atmospheric tanks (with either fixed or floating roofs) can be used to store liquids and slurries. Sludges and solids can be containerized and stored in engineered structures. Strict standards must be met to ensure that wastes do not come in contact with each other or the outside environment. Considerations include storage facility design and construction (the use of impervious construction materials, drainage and barriers, ventilation, fire and explosion resistance, static electricity and temperature control, etc.); operating guidelines (container specifications and usage, drum storage, labelling, and waste compatibility); and security and safety precautions (contingency planning, monitoring, record keeping and reporting).

Wastes Handled: Above-ground storage systems provide a temporary home for those wastes which are unsuitable for landfill disposal and for which no viable treatment technology or economical recycling option currently exists.

Availability: Much of Canada's PCB waste is currently in storage awaiting the construction of appropriate destruction facilities. (Also see Landfilling, Deepwell Disposal, Disposal, and Underground Storage.)

Absolute Ethanol

See Ethyl Alcohol.

Absorption

Partial or complete assimilation of one chemical into the structure of the liquid or solid phase of another. The process can usually be reversed by increasing the temperature and/or lowering the pressure.

Acceptable Daily Intake (ADI)

Estimate of the largest amount of chemical to which a person can be exposed on a daily basis without adverse effect being anticipated (usually expressed in mg/kg of body weight/day). (Also see Toxic Equivalency Factor.)

Accident Event

(1) As used in reference to transportation: a motor vehicle collision which causes death, injury, or property damage exceeding a certain dollar value. In Ontario, the threshold property damage values changed from $400.00 to $700.00 in 1985. (2) In hazard analysis this refers to unexpected or undesirable events that occur in an industrial plant due to equipment failure or human error.

Accothion

See Organophosphates.

Acetic Acid

Formula: CH_3 COOH

Synonyms: acide acetique (Fr.), ethanoic acid, ethylic acid, glacial acetic acid, methane-carboxylic acid, pyroligneous acid, vinegar acid

Description: clear, colourless liquid with a pungent, vinegar-like odour; soluble (sinks and mixes with water); moderate fire risk, releasing toxic fumes; incompatible with

strong caustics and oxidizers, chromic and nitric acids; stable
Uses: used in the manufacturing of a number of chemicals, plastics, pharmaceuticals, dyes, insecticides, and photographic chemicals; food additive; latex coagulant; textile printing; oil well acidizer
Health Hazards: strong irritant; concentrated exposure may cause severe skin, eye and lung damage, blindness; chronic exposure causes inflammation of the nose and throat, erosion of the teeth, darkening and irritation of the skin; bronchitis

Acetic Anhydride

Formula: $(CH_3CO)_2O$
Synonyms: acetic oxide, acetyl ether or oxide, anhydride acetique (Fr.), ethanoic anhydride
Description: clear, colourless, very mobile, strongly refractive liquid; strong odour; soluble in cold water, but decomposes in hot water to form acetic acid; combustible, emitting toxic fumes; reacts violently with water, alkalis, and many acids; stable
Uses: used in production of plastics and synthetic fibres, pharmaceuticals, dyes, perfumes, explosives, pesticides, food starch and flavourings
Health Hazards: strong irritant and corrosive; may cause contact dermatitis, severe but delayed burns (skin turns red, then white and peels) and eye damage; inhalation leads to irritation of nose and throat, coughing, chest pain and nausea

Acetic Oxide

See Acetic Anhydride.

Acetone

Formula: CH_3COCH_3
Synonyms: ketone propane, 2-propanone
Description: clear, colourless liquid with sweet mint-like odour; extremely flammable, highly volatile; soluble in water; reacts violently with chromic acid, chloroform, hydrogen peroxide, etc.; stable
Uses: 25 kilotonnes are used in Canada each year; as a paint, varnish or lacquer solvent; for cleaning precision machinery; as a spinning solvent and delusterant; in the production of lubricating oils, chloroform, pharmaceuticals and pesticides
Health Hazards: irritant to eyes, nose, throat and central nervous system; coughing, headache, nausea, dizziness; narcotic at high doses; skin becomes dry, sore and infected

Acetophenone

See Ketones.

Acetylen

See Acetylene.

Acetylene

Formula: C_2H_2
Synonyms: ethine, ethyne, narcylene
Description: colourless, odourless gas (commercial grades may have garlic-like odour due to impurities); quite soluble in water (floats); very dangerous fire risk, burning with an intense, hot flame; reacts vigorously with oxidizing materials; and violently with fluorine, chlorine, bromine, iodine and nitric acid; forms explosive compounds with copper, silver, mercury
Uses: used in welding, cutting, brazing and hardening metals; used in the manufacture of vinyl chloride, acrylonitrile, synthetic rubber and other compounds
Health Hazards: relatively nontoxic, but can cause asphyxiation (by diluting the oxygen in the room); mild narcotic at high concentrations; exposure to impurities (arsine, hydrogen sulphide, phosphine, carbon disulphide, carbon monoxide) can cause illness or death

Acetyl Ether

See Acetic Anhydride.

Acetyl Oxide

See Acetic Anhydride.

Acid

A large class of chemical substances whose water solution can release a positively charged hydrogen ion (proton). Some weak acids (e.g., vinegar) have a characteristic sharp, sour taste. Acids dissolve many metals with evolution of hydrogen gas and turn litmus paper red. (Also see Acidity.)

Acide Acetique

See Acetic Acid.

Acide Carbolique

See Phenol.

Acide Chlorhydrique

See Hydrochloric Acid.

Acide Cyanhydrique

See Hydrogen Cyanide.

Acide Fluorhydrique

See Hydrofluoric Acid.

Acide Nitrique

See Nitric Acid.

Acide Phosphorique

See Phosphoric Acid.

Acide Picrique

See Picric Acid.

Acide Sulphhydrique

See Hydrogen Sulphide.

Acide Sulphurique

See Sulphuric Acid.

Acid Gases

Acidic vapours, such as hydrogen chloride, often associated with incinerator emissions. (Acid gases may also refer to those gases contributing to acidic precipitation, particularly sulphur dioxide and nitrogen oxides.)

Acidity

A measure of the hydrogen ion concentration in a solution. Substances with a pH value of less than 7 are acidic. For example, lemon juice has a pH of about 2. (Also see Acid.)

Acid Waste

Generally an aqueous waste having a pH below 5.

Acrylonitrile

Formula: $CH_2 CHCN$
Synonyms: AN, cyanoethylene, ent 54, nitrile acrylique (Fr.), propenenitrile, vinyl cyanide
Description: colourless, mobile liquid with a mild acrid odour; partially soluble in water; dangerous fire risk, flammable and explosive; unstable and easily oxidized, can react vigorously with oxidizing materials; incompatible with ammonia, copper, strong bases, amines
Uses: used in the manufacture of synthetic fibres, plastics, rubbers, adhesives and other chemicals; used as pesticide
Health Hazards: carcinogen; renders cells incapable of carrying oxygen leading to flushing of face, increased salivation, difficulty breathing, nausea, vomiting and oppressive feeling in the chest; irritation of eyes and nose, and blistering of skin

Actinolite

See Asbestos.

Activated Carbon

A granular or finely divided form of charcoal treated to make it largely porous and capable of high adsorption. Used in gas and water purification. (Also see Carbon Adsorption.)

Activated Sludge

Description: Liquid wastes are mixed with air (some systems use pure oxygen) and a microbiological sludge (or floc) and held in an aerated tank for 2 to 24 hours while living organisms metabolize and biologically flocculate the organics in the wastewaters. The microorganisms in the mixed liquor are then allowed to settle in a secondary clarifier. A portion of the sludge is returned to the aeration basin to maintain the microorganism population, while the remainder is withdrawn for dewatering, disposal or methane generation. Sludge tanks may be open to the atmosphere or closed and vented; the reaction is less efficient in cold weather. Neutralization, equalization and suspended solids removal usually precede activated sludge treatment.

Wastes Handled: The activated sludge process is used to treat dilute aqueous organic waste streams (both domestic and industrial) containing less than 1% suspended solids. The system is mechanically simple, but is sensitive to changes in flow, dissolved oxygen and nutrient levels, temperature, pH and shock loadings of toxic pollutants. The process is not designed to handle heavy metals or halogenated organics.

Availability: Variations on the basic activated sludge process include tapered aeration, step aeration, complete mix, contact stabilization, extended aeration, sequencing batch reactor, and rotating biological contactor. (Also see Aerated Lagoon, Biological Treatment, Fluidized Bed Biological Contactor, Rotating Biological Contactor, Sequencing Batch Reactor, Trickling Filter, and Waste Stabilization Pond.)

Acute Exposure

Exposure of short duration. In risk assessment, exposures of a few hours or less are termed acute. (Also see Chronic Exposure, and Subchronic Exposure.)

Acute Health Effects

Health effects that occur or develop rapidly after exposure to a substance. (Also see Chronic Health Effects.)

Acute-Safe-Exposure-Level (ASEL)

Prediction of single exposure values based on no-observed-effect-level (NOEL), derived from short-term duration studies.

Additives and Reagents

Substances used to chemically reformulate wastes as part of the physical/chemical treatment or to treat them prior to disposal in a landfill site (e.g., basic reagents to neutralize acids; cement, sodium silicate and hydrated lime for treating wastes prior to disposal in landfill).

Adhesion

The attraction which holds the surfaces of two substances in contact. An example is water and rock particles.

Adjusted Margin of Safety (AMOS)

Estimate of the largest amount of chemical exposure, on a daily basis, which is not anticipated to result in adverse effects (usually expressed in mg/kg of body weight/day) divided by the actual amount of human exposure in a population. An AMOS value greater than or equal to one indicates no adverse effect is expected. (Also see Safety Factor.)

Adsorb

To collect, as a gas or liquid, in condensed form on the external or internal surfaces of another substance. (Also see Condensate.)

Adsorption

Molecular attraction which holds the surfaces of two substances in contact. (Also see Carbon Adsorption, and Resin Adsorption).

Advanced Electric Reactor (AER)

Description: The AER process rapidly heats materials to about 2,200°C using intense thermal radiation in the near infra-red region; the incandescent reactor core is isolated from the introduced waste stream by a gaseous blanket of flowing nitrogen. Since destruction is accomplished by pyrolysis (rather than oxidation), carbon monoxide, carbon dioxide and nitrogen oxides are not produced in significant concentrations. The residues then pass through a second high-temperature (1,100°C) insulated chamber and a cooling chamber; the solids go to a collection bin, and the gases are directed to air pollution control equipment.

Wastes Handled: The system can handle extremely hazardous, low-Btu wastes (such as PCBs or dioxins) in either gaseous, liquid

or solid form. It can also support the recovery of valuable by-products.
Availability: The process is commercially available. (Also see Incineration, Pyrolysis, and Thermal Treatment.)

Advanced Oxygen Combustion

Description: This incinerator burner system, with its advanced fuel injection and mixing concepts, provides for faster ignition and more thorough burning of wastes. Computer controls allow automatic adjustment of oxygen levels according to sudden changes in the heating value of the waste. Oxygen enrichment from 21-100% (burned in combination with air and natural gas) raises combustion temperature up to 2,500°C, while reducing retention time. In some cases, nitrogen oxides emissions may be increased and local overheating may be a problem.
Wastes Handled: The technology is applicable to any waste that can be incinerated, although the advantages are maximized when treating solids contaminated with hazardous organics. Solids and sludges can be co-incinerated when the burner is used in conjunction with a rotary kiln or similar equipment.
Availability: Still in a demonstration stage, the technique can be easily retrofitted onto various existing incinerators (including mobile units), increasing their capacity by a factor of two or three, reducing fuel needs, and potentially increasing both destruction and removal efficiencies. (Also see Incineration, and Thermal Treatment.)

Advection

The process by which solutes are transported by the bulk motion of flowing groundwater.

Aerated Lagoon

Description: Aerated lagoons are dilute activated sludge processes in which longer retention times (typically two to four days) are used to biodegrade wastes. Outdoor lagoons, 1.8 to 3.6 meters-deep, are equipped with either mechanical surface aerators or diffused air (sprayers) to introduce oxygen and speed up the natural biological decomposition of organic wastes. A second-stage pond is used to remove suspended solids from the liquors produced in the aerated lagoon; there is no sludge recycling, and sludge deposits must eventually be removed by dredging.
Wastes Handled: Lagoons can be used to treat the same range of wastes as activated sludge processes, although generally at lower concentrations. Because of the large volumes handled, lagoons are generally well protected from loadings. The process has been used to successfully treat petrochemical, textile, and refining wastes. It is not adequate for wastes with high levels of metals or solids.
Availability: Aerated lagoons are easy to construct and maintain. (Also see Activated Sludge, Anaerobic Digestion, and Waste Stabilization Ponds.)

Aeration

The act of exposing a liquid to air (oxygen) with the aim of producing a high level of dissolved oxygen in the liquid. (Also see Air Sparging, Air Stripping, and Flotation.)

Aerobic

Having molecular oxygen as part of the environment; growing only in the presence of molecular oxygen, such as aerobic organisms; occurring only in the presence of molecular oxygen, such as aerobic decomposition. (Also see Anaerobic.)

Aerobic Wastewater Treatement

See Activated Sludge, and Aerated Lagoon).

Aerosol

Solid or liquid particles, usually less than one micron in diameter suspended in a gaseous medium.

Afterburner

A device that includes an auxiliary fuel burner and combustion chamber, which completes the combustion of organic materials following the primary combustion process. (Also see Secondary Combustion Chamber.)

Agricultural Waste

Poultry and livestock manure, or residual materials in liquid or solid form generated in the production and marketing of poultry, livestock, fur-bearing animals, and their products, provided that such agricultural wastes are not hazardous. Includes the residual materials, generated in producing, harvesting, and marketing of all agricultural, horticultural and silvicultural crops or commodities grown on what are usually recognized and accepted as farms, forests, or other agricultural lands.

AHF

See Hydrofluoric Acid.

Air Flotation

See Flotation.

Air Injection

A method of cooling flue gases by injection of cooler (normally ambient) air directly in the hot flue gas stream. The gas weight is increased by an amount equal to the weight of air introduced.

Air Shed

Air space in which emissions from a facility are dispersed.

Air Sparging

Blowing air through a liquid for mixing purposes, to strip volatile material or to add oxygen. (Also see Aeration and Air Stripping.)

Air Stripping

Description: In this relatively simple operation, air is passed through an aqueous stream to remove the volatile components. There are four basic configurations to air strip liquid wastes: cross-flow tower, coke tray aerator, diffused air basin and most commonly, a packed column. In the packed column system, a thin film of dilute waste or polluted groundwater is introduced at the column top, while the air flows up from the bottom of the tower to strip volatile organics and gases in a counter-current action. The treated wastewaters may require further cleaning, or polishing, before re-use or discharge. The effluent gases collected at the top of the column are usually directed to a carbon adsorption unit, incinerator, condenser or other air cleaning equipment.
Wastes Handled: The process is used to treat dilute wastewaters or groundwaters containing a low concentration (less than 1%) of volatile organics, such as ammonia, solvents and hydrocarbons. The efficiency of air stripping decreases when the temperature drops.
Availability: Commercial air stripping systems, some with more than 10 years of operating data, are offered by a number of companies. Mobile systems are available for treating contaminated groundwater on-site. A rotary stripper under development replaces the need for a tall column by using a rotating porous wheel. (Also see Aeration, Ammonia Stripping, Steam Stripping.)

Al

See Aluminum.

Albone

See Hydrogen Peroxide.

Alcohol

See Ethyl Alcohol.

Alcool Ethylique

See Ethyl Alcohol.

Alcool Isopropylique

See Isopropyl Alcohol.

Aldehyde Formique

See Formaldehyde.

Aldicarb

See Carbamates.

Aldrin

See Chlorinated Hydrocarbons.

Aliphatic Compound

An organic compound characterized by the straight or branched chain arrangement of the constituent carbon atoms. For example, ethyl alcohol is an aliphatic compound.

Alkali

Any substance which in water solution turns litmus paper blue, has a pH value greater than 7, is typically bitter and more or less irritating or caustic to the skin. Lime ($Ca(OH)_2$) is an alkali. (Also see Alkalinity.)

Alkaline Waste

Generally an aqueous waste having a pH typically greater than 9.

Alkalinity

A measure of the hydroxyl ion concentration in a solution. Alkalinity is expressed as a pH value of more than 7 up to 14. It is also indicated by turning litmus paper blue. (Also see Alkali.)

Alum

Chemical substance (usually aluminum sulfate) used in water treatment plants for coagulating small particles of foreign matter.

Alumina Fibre

See Aluminum.

Aluminum

Formula: Al
Description: light, silvery-white, ductile metal; soluble in acids and alkalis, insoluble in water; dust is a moderate fire/explosion risk when exposed to heat, flames or powerful oxidizers
Uses: used in ships, aircraft, automobiles, the electrical industry, construction, light manufacturing, jewelry, packaging, and foils; aluminum powders used in paints and pyrotechnics
Health Hazards: inhalation of finely divided powders may cause lung fibrosis; aluminum salts may irritate the eyes, skin and upper respiratory tract; may be implicated in Alzheimer's disease

Amaze

See Organophosphates.

Ambient Noise Levels

The existing or future background noise levels at an area or individual residence. Such ambient levels include road traffic noise.

Amines

Substances derived from ammonia by substituting some other group (usually an organic group) for one or more of the hydrogen atoms. Amines are weak alkalis.

Aminobenzene

See Aniline.

Aminocarb

See Carbamates.

Aminophen

See Aniline.

Ammonia

Formula: NH_3
Synonyms: ammonia anhydrous, ammoniac, ammonia gas, spirit of hartshorn
Description: colourless gas (liquefied under pressure) with extremely pungent, suffocating odour; very soluble in water (floats, boils and mixes); low fire hazard (difficult to ignite), but will emit toxic fumes of NH_3 and NO_X; incompatible with wide variety of materials, including strong oxidizers, bleaches, calcium, gold, mercury, silver
Uses: used as a fertilizer (alone or in combined forms); refrigerant; used in the steel, petroleum, tanning, dyeing and chemical industries; used to make synthetic fibres, plastics, urea formaldehyde, glues, explosives, and many drugs and pesticides; latex preservative
Health Hazards: severe irritant to eyes, skin

and respiratory tract, including burns and temporary blindness; inhalation may cause severe breathing difficulties, coughing, chest pain, headache, nausea; concentrated fumes may be fatal; liquid ammonia causes frost bite

Ammonia anhydrous

See Ammonia.

Ammoniac

See Ammonia.

Ammonia gas

See Ammonia.

Ammonia Stripping

The method used in the treatment of ammonia-bearing wastes. By stripping alkaline aqueous wastes with steam in a special column, the ammonia is removed and can be condensed and reclaimed for sale. The remaining liquids will be almost completely free of ammonia. The process can also be used to remove various volatile and organic contaminants from the waste stream. (Also see Air Stripping and Steam Stripping.)

Ammonium Nitrate

Formula: NH_4NO_3

Description: odourless, colourless or white-grey crystals; soluble in water (sinks and mixes); fire risk, emitting toxic NO_x; may explode under conditions of confinement, high pressure, or when mixed with combustibles; can ignite when mixed with acetic acid; an oxidizing substance, it reacts with powdered metals, chloride, phosphorus, sodium and sulphur

Uses: used primarily as a fertilizer or in the production of pyrotechnics and explosives; also used in herbicides and insecticides, and the chemical industry; ingredient in anti-freezing mixtures

Health Hazards: practically nontoxic; dust is irritating to eyes and mucous membranes; reports of faintness and high blood pressure in exposed workers; possibility of ammonia poisoning during fertilizer manufacturing

Amosite

See Asbestos.

Amphibole

See Asbestos.

AN

See Acrylonitrile.

Anaerobic

Life or processes that occur in the absence of molecular oxygen; growing in the absence of molecular oxygen, such as anaerobic bacteria; occurring in the absence of molecular oxygen, such as anaerobic decomposition. (Also see Aerobic, and Anaerobic Digestion.)

Anaerobic Contact Process

See Anaerobic Digestion.

Anaerobic Digestion

Description: This continuous biological treatment process utilizes a mix of anaerobic micro-organisms to digest organic wastes in an oxygen-free environment. Anaerobic digestion generates a methane-rich bio-gas (that can be collected and used as fuel), an aqueous effluent, and a residual sludge. The entire process takes place in a closed tank and may require external heat to maintain a constant temperature. Sludge volumes are generally lower than those produced by aerobic biological treatment systems.

Wastes Handled: Can be used to treat biodegradable organic wastewaters and sludges. Can handle more concentrated solutions than those treated in activated sludge systems. However, the system can be disrupted by shock loadings, heavy metals, high concentrations of alkalis and certain pesticides.

Availability: Anaerobic digestion systems are installed in many municipal sewage treatment plants. Widely used in Europe, packaged anaerobic systems are now being marketed in North America to treat brewery, pulp and paper, food processing and other industrial wastewaters. Available configurations include conventional two vessel systems, fluidized bed digesters, upflow sludge-blanket digesters, the anaerobic filter, and the anaerobic contact process. (Also see Biological Treatment.)

Anaerobic Filter

See Anaerobic Digestion.

Anatomical Waste

See Pathological Waste.

Anhydride Acetique

See Acetic Anhydride.

Anhydride Carbonique

See Carbon Dioxide.

Aniline

Formula: $C_6H_5NH_2$
Synonyms: aminobenzene, aminophen, benzenamine, blue oil, huile d'aniline (Fr.), phenylamine
Description: colourless to yellow-brown, oily liquid with characteristic odour and taste; soluble in water (sinks, though not in salt water); flammable, emitting toxic NO_X and carbon monoxide; reacts vigorously with oxidizing materials, strong acids, and a number of other compounds
Uses: one of the most important organic bases, the parent substance in many drugs and dyes; also used in photographic chemicals, rubber accelerators and anti-oxidants, resins, varnishes, shoe polishes, explosives, herbicides and fungicides, perfumes, and many other organic chemicals
Health Hazards: cuts blood's ability to carry oxygen, leading to headache, weakness, blue pallor, irritability, drowsiness, shortness of breath, unconsciousness, and even death; may affect liver, bladder; liquid aniline is mildly irritating to the eyes

Anion

A negatively charged ion.

Anion Complex Wastes

One type of aqueous waste often generated from metal finishing processes and the electronics industry. These include cyanide and sulphide plating baths, and cyanide-containing sludges.

Anprolene

See Ethylene Oxide.

Anthophyllite

See Asbestos.

Antiformin

See Sodium Hypochlorite.

Anti-freeze

See Ethylene Glycol.

Anti-Knock Compound

See Tetraethyl Lead.

Antimony and its Compounds

Formula: Sb
Synonyms: antimony black, stibium
Description: silvery-grey, lustrous, soft metal; insoluble in water; dusts and vapours are moderate fire/explosion hazard; highly toxic stibine gas may be released under certain conditions; incompatible with acids
Uses: hardening alloy for lead (in storage batteries and cable sheaths), solder, type and bearing metals, sheet and pipe, collapsible tubes and foil; semiconductor technology; antimony compounds are used as abrasives, pigments, flameproofing compounds, plasticizers, and in the production of paints, pyrotechnics, lacquers, glass, pewter, pottery, enamels and glazes
Health Hazards: primary skin irritant (lesions appear on moist areas of the body) causing intense itching; also irritate eyes, nose and throat; over time, attack enzyme

systems, heart, lungs, respiratory tract, liver, and kidneys; chronic oral poisoning leads to dry throat, nausea, headache, dizziness, sleeplessness, loss of appetite

Antimony Black
See Antimony.

APCD
Air Pollution Control Devices.

Aqua Fortis
See Nitric Acid.

Aqueous
Refers to a solution in which the solvent is water.

Aqueous Inorganic Waste
Liquid waste which contains inorganics with a major portion being water. Pickle liquor is an example. (Also see Inorganic Waste.)

Aqueous Organic Waste
Liquid waste which contains organics with a major portion being water, such as an oil/water mixture. (A slash — aqueous/organic — is sometimes used to indicate the waste is an insoluble mixture rather than a solution.)

Aqueous Solution
Waste mixture composed of dissolved substances suspended in a watery medium.

Aqueous Treatment
A waste treatment system designed to remove contamination from water so that it can be returned to the environment safely.

Aqueous Waste
A liquid waste with a major portion being water. (Also see Aqueous Organic Waste and Aqueous Inorganic Waste).

Aquifer
A saturated permeable geologic formation capable of yielding significant quantities of groundwater to wells and springs.

Area of Important Biological Resources (AIBR)
An area which includes significant wildlife and waterfowl habitat (e.g., deer wintering areas, waterfowl staging areas and wildlife travel corridors) and significant fisheries habitat (e.g., areas which support a recreational fishery, bait fishery or spawning/migratory area). This term has been designated by the Ontario Ministry of Natural Resources. (Also see Area of Natural and Scientific Interest, Environmentally Sensitive/Significant Areas and Significant Environmental Unit.)

Area of Natural and Scientific Interest (ANSI)
An area of land and water containing natural landscapes or features which have been identified as having values related to protection, natural heritage appreciation, scientific study or education. This term has been designated by the Ontario Ministry of Natural Resources. (Also see Area of Important Biological Resources, Environmentally Sensitive/Significant Areas, and Significant Environmental Unit.)

Arochlor
See Polychlorinated Biphenyls.

Aromatic Compounds
A major group of unsaturated, cyclic organic compounds containing one or more rings. These are typified by benzene, which has a six-carbon ring containing three double bonds.

Aromatic Solvent
See Naphtha.

Arsenic and its Compounds

Formula: As

Synonyms: common compounds include arsenic trioxide (white oxide), arsenic trichloride, arsenic disulphide, arsenic pentoxide, arsenic trisulphide

Description: metallic arsenic is a silvery-grey, brittle, crystalline solid that darkens in moist air, or a black powder (other compounds range from orange crystals to oily liquids); insoluble in water (sinks); dangerous arsine fumes are emitted when heated to decomposition, when metal arsenic comes in contact with acids or hydrogen gas, or when arsenic solutions come in contact with active metals (iron, aluminum, zinc, etc.); not flammable, but burns spontaneously with chlorine gas

Uses: used as an insecticide, herbicide, defoliant, silvicide, desiccant, rodenticide, antifouling paint; alloying additive for metals (shot, battery grids, cable sheaths, boiler tubes, etc.); special solders; used in electronics industry, glassmaking, pigments, textile printing, taxidermy

Health Hazards: suspected carcinogen; acute poisoning may cause nausea, vomiting, severe pain and thirst, diarrhea, tightness in chest, shock, collapse, coma and death; irritates mucous membranes, skin problems include itching, mottled reddening, bronzing; chronic exposure may cause digestive disturbances (cramps, nausea, etc.), damage to liver (jaundice), blood, kidneys, and nervous system (especially in the arms, legs, hands and feet); inorganic arsenicals more toxic than organics

Arsenic Disulphide

See Arsenic.

Arsenic Pentoxide

See Arsenic.

Arsenic Trichloride

See Arsenic.

Arsenic Trioxide

See Arsenic.

Arsenic Trisulphide

See Arsenic.

As

See Arsenic.

Asbestos

Synonyms: actinolite, amosite, anthophyllite, chrysotile, crocidolite, tremolite

Description: family of naturally occurring mineral silicate fibres, may be white, grey, green or brown in colour; can be grouped into two classes: (1) chrysotile, or "white asbestos", made up of long, thin flexible fibres, capable of being spun together, and (2) amphibole, made up of short, brittle fibres which are more likely to become airborne (and includes amosite or "brown asbestos", crocidolite or "blue asbestos", tremolite, actinolite, and anthophyllite); all are insoluble and noncombustible

Uses: used most often in construction industry (in asbestos cement, insulation and acoustical materials, roofing felts and shingles, floor tiles, etc.); also used in brake linings, fire proof fabrics, gaskets, chemical filters, diaphragm cells, paint fillers; as a reinforcing agent in rubber and plastic

Health Hazards: highly toxic and a proven carcinogen (although symptoms may not appear for 15-40 years following exposure); prolonged exposure may result in (progressively worsening) shortness of breath, dry cough, abdominal discomfort, chest pain, lung fibrosis (asbestosis) and cancer (mesotheliomas, lung and gastrointestinal cancers); shorter asbestos fibres are less carcinogenic; cancer risk increases if victim also smokes

Askarel

See Polychlorinated Biphenyls.

At-Sea Incineration

Description: Burning wastes at sea using available thermal treatment technologies eliminates many of the siting/NIMBY problems inherent in land-based systems. No air pollution control systems are installed on the ship-mounted incinerators; in theory, air emissions and ashes are diluted in sea air and water to undetectable and presumably harmless levels.

Wastes Handled: All waste streams amenable to conventional incineration can be incinerated at sea, including organic and organic/inorganic mixtures, liquids, slurries and sludges.

Availability: Several ship-mounted hazardous waste incinerators serve the European market. Although some testing has been undertaken, no North American jurisdiction has sanctioned the operation of at-sea incineration facilities. (Also see Incineration.)

Attenuation Mechanisms

Processes which reduce contaminant concentrations in leachate in the ground over time. These include dilution, adsorption, dispersion and biological and chemical degradation.

Avadex BW

See Carbamates.

Azinphosmethyl

See Organophosphates.

Azote

See Nitrogen Oxides.

Azotic acid

See Nitric Acid.

Azoto

See Nitrogen Oxides.

B

Backwash

Reverse flow of fluid through a filter medium to remove deposited solids.

Bacteria

Single-cell, microscopic organisms that possess rigid cell walls. Some are important in the treatment of wastes.

Baghouse

An air tight enclosure containing filter bags used to collect particulates from sources of emissions.

Balancing Waste Reservoir

See Equalizing Basin.

Barban

See Carbamates.

Base

See Alkali.

Baseline Conditions

Existing biophysical and socio-economic conditions at a site.

BAT(EA)

Best Available Technology (Economically Achievable).

Battery Acid

See Sulphuric Acid.

Baygon

See Carbamates.

Baytex

See Organophosphates.

BDAT
Best Demonstrated Available Technology.

Be
See Berylium.

Belt Filter Presses
See Filtration.

Benchmark Values
Values that can be used for comparison purposes.

Bench Scale Test
Testing on a small scale, normally conducted in a laboratory.

Bensulfoid
See Sulphur.

Benzenamine
See Aniline.

Benzene
Formula: C_6H_6
Synonyms: benzin, benzine, benzol, benzole, benzolene, bicarburet of hydrogen, carbon oil, coal naphtha, cyclohexatriene, mineral naphtha, motor benzol, nitration benzene, phene, phenyl hydride, pyrobenzol
Description: colourless to light-yellow liquid with aromatic odour; slightly soluble (floats on water); flammable liquid (forms explosive mixtures in air, and flashback can occur along vapour trail); reacts vigorously with chlorine, chromates and perchlorates
Uses: used in the production of ethylbenzene/styrene, cumene, cyclohexane (for nylon), maleic anhydride, detergents, and other chemical compounds
Health Hazards: human carcinogen (linked to leukemia); inhalation of vapour causes headache, confusion, dizziness, nausea, difficulty breathing, bronchitis, pneumonia (effects are cumulative); prolonged skin exposure causes irritation and similar symptoms; chronic exposure may lead to fatigue, headache, loss of appetite and weight, nausea, bleeding gums and nose bleeds.

Benzene Hexachloride
See Chlorinated Hydrocarbons.

Benzin, or Benzine
See Benzene.

Benzinoform
See Carbon Tetrachloride.

Benzol, Benzole, or Benzolene
See Benzene.

Benzophenol
See Phenol.

Berm
A barrier used as a mitigative measure against visual and noise impacts or to contain spills. Berms are commonly made of earth, clay or concrete. (Also see Dike.)

Bertholite
See Chlorine.

Berylium and its Compounds
Formula: Be
Synonyms: glucinum
Description: a light-weight but strong, grey metal; slightly soluble in hot water; moderate fire and explosion hazard when dust/ powder is exposed to fire, emits very toxic fumes of BeO when heated; reacts with lithium, potassium; incompatible with acids, alkalis, chlorinated hydrocarbons, and oxidizable materials
Uses: used extensively in the manufacture of electrical components, X-ray tubes, chemicals, and ceramics; added to a number of alloys; also released through the burning of coal; common berylium compounds include berylium chloride, berylium fluoride, and berylium nitrate

Health Hazards: a carcinogen; soluble beryllium salts are irritants and skin sensitizers, causing delayed dermatitis, ulcers, nonhealing lesions, and eye damage; highly toxic by inhalation, the symptoms include coughing, chest pain, shortness of breath, weight loss, and at higher levels, severe chemical pneumonitis and edema; chronic "beryllium disease" (which may not appear for 5-10 years following exposure) may entail respiratory symptoms, weakness and fatigue, weight loss, joint pain; more severe forms of the disease may include chills and fever, liver and lung problems, physical wasting, heart damage, and death

Berylium Chloride

See Berylium.

Berylium Fluoride

See Berylium.

Berylium Nitrate

See Berylium.

BHC

See Chlorinated Hydrocarbons.

Bicarburet of Hydrogen

See Benzene.

Bicarburetted Hydrogen

See Ethylene.

Bichlorure d'Ethylene

See Ethylene Dichloride.

Biethylene

See 1,3-Butadiene.

Bifluoriden

See Fluorine.

Bioaccumulation

Degree to which chemicals tend to concentrate in plant and animal tissue.

Bioassay

The employment of living organisms to determine the biological effect of some substance, factor or condition.

Biochemical Oxygen Demand (BOD)

A measure of the amount of oxygen used in the biochemical oxidation of organic matter in water over a specific time under specific conditions. BOD_5 is the BOD measurement in a five-day test. It is a standard test used in assessing wastewater strength.

Bioconcentration

The process through which chemicals concentrate in the tissues of plants and animals via uptake from environmental media such as water or soil.

Biodegradable

Any substance that can be decomposed through the action of micro-organisms.

Biological Denitrification

See Denitrification.

Biological Hazardous Wastes

Any substance of a human or animal origin — other than food wastes — which is to be disposed of and could harbour or transmit pathogenic organisms including, but not limited to pathological specimens such as tissues, blood elements, excreta, secretions, bandages, and related substances. (Also see Biomedical Wastes, Infectious Waste, and Pathological Waste.)

Biological Magnification

The concentration of certain substances up a food chain. A very important mechanism in concentrating pesticides and heavy metals in organisms such as fish-eating birds and other carnivores.

Biological Nitrification

See Nitrification.

Biological Treatment

Description: Living organisms, such as bacteria, algae, fungi and microorganisms, are used to stabilize, adsorb, alter or break down organic wastes into carbon dioxide, water, and other simple molecules.

Wastes Handled: Biological treatment systems will handle aqueous organic waste streams containing biodegradable pollutants, such as starch, cellulose, fats, oils and greases. Certain toxic organics and metallic contaminants may upset the biological treatment process or accumulate in the sludge (making final disposal problematic).

Availability: Although applications are constantly being modified and improved, biological treatment systems are well established and have been employed in sewage treatment and industrial wastewater treatment plants for decades. The development of specialized enzyme treatments is a field of ongoing research. (Also see Activated Sludge, Aerated Lagoon, Anaerobic Digestion, Bioremediation, Composting, Enzyme Treatment, Fluidized Bed Biological Contactor, Landfarming, Rotating Biological Contactor, Sequencing Batch Reactor, Trickling Filter, and Waste Stabilization Pond.)

Biomagnify

To increase concentrations of chemicals as they are transmitted from plants to animals (in the food chain).

Biomedical Waste

Waste that includes anatomical waste, pathological waste, infectious waste, hazardous waste, and other waste generated in health care facilities and medical laboratories that requires special handling. (Also see Biological Hazardous Wastes.)

Biomonitoring

The routine sampling and analysis of biological systems to document environmental change. (Also see Monitoring.)

Biorefractory Organics

Organics which are not readily amenable to biological treatment.

Bioremediation

Description: Either indigenous or introduced micro-organisms are used to break down, in-situ, the pollutants in groundwater and soil. Environmental conditions (pH, nutrient levels, oxygen content, moisture, osmotic pressure, and even temperature) may be adjusted in order to encourage the development of specific populations of aerobic or anaerobic organisms and to maximize the efficiency of the biodegradation process. A variation of the technique involves the removal of contaminated soil or sludge and its treatment in a large, mobile bio-reactor in which environmental conditions can be more carefully controlled.

Wastes Handled: Bioremediation techniques have been used to break down dilute organics (such as gasoline, diesel fuel, pesticide residues, creosote, cyanide, etc.) and other biodegradable contaminants found in polluted soils and groundwater. High concentrations of certain metals may inhibit the biological process.

Availability: A number of in-situ treatment systems, as well as commercially available micro-organisms and cultures, are currently in use. Others are under development or being field tested. (Also see Biological Treatment, Composting, Enzyme Treatment, Injection Grouting, In-Situ Chemical Treatment, Landfarming, and Solidification/Stabilization.)

Bioxyde d'Azote

See Nitrogen Oxides.

Birlane

See Organophosphates.

Bivinyl

See 1,3-Butadiene.

B-K Liquid

See Sodium Hypochlorite.

Black Liquor

An aqueous process stream from the kraft pulping processes that has a high sodium sulphate and organic content.

Blending/Equalization

Description: Batches of compatible wastes can be mixed and blended, either in-line or in a mixing tank, prior to treatment. Equalization involves the use of agitators to mix wastes, keep solids in suspension, and produce a more homogeneous, consistent waste stream for subsequent treatment. It may also allow chemical interaction between certain waste sources, such as acids and bases, and achieve a degree of neutralization. Blending/equalization is a starting point for many treatment processes.

Blue Asbestos

See Asbestos.

Blue Oil

See Aniline.

Blue Powder

See Zinc.

Boiler Ash

Particulates in the flue gases from combustion processes which are collected and removed from the boiler.

Boiler Blowdown

That portion of the water in the boiler's water circulatory system that is discharged to maintain the concentration of total solids (dissolved and suspended) below predetermined levels.

Borehole

A hole bored into the ground to extract a core to study soil or rock characteristics. (Also see Well.)

Bottom Ash

The non-airborne combustion residue that remains on a hearth, falls off the grate, or is otherwise discharged after thermal processing is complete. (Also see Fly Ash.)

Bottom Sediment and Water (BS&W)

A measure of quality in used fuel oils and lubricants.

Br

See Bromine.

Brimstone

See Sulphur.

Brine

Water saturated with or containing large amounts of salts. (Also see Sodium Chloride.)

Brocide

See Ethylene Dichloride.

Buffer Zone

Area surrounding an industrial facility or landfill which serves to screen and otherwise mitigate off-site impacts. Residences and commercial uses are generally restricted or not permitted in a buffer zone.

Brom, or Brome

See Bromine.

Bromine

Formula: Br
Synonyms: brom, brome, bromo, broom
Description: a dark reddish-brown, fuming, volatile liquid with a suffocating odour; slightly soluble in water; attacks most metals, reacts vigorously with aluminum, explosively with potassium; strong oxidizing agent (may ignite combustibles on contact)

Uses: used primarily in the manufacture of gasoline anti-knock compounds (1,2-dibromoethane); also used in gold extraction, bleaching of fibres and silks, dyestuffs in the chemical industry, and the production of pesticides and drugs
Health Hazards: extremely irritating to the eyes, skin and upper respiratory tract, may cause severe burns or acne-like lesions; high levels may cause bronchitis, pulmonary edema or death; chronic exposure results in coughing, running nose and nose bleeds, respiratory difficulties, vertigo, headache, nausea, diarrhea and hoarseness

Bromo

See Bromine.

Bromofume

See Ethylene Dibromide.

Bronze Powder

See Copper.

Broom

See Bromine.

Brown Asbestos

See Asbestos.

Btu

British thermal unit, the quantity of heat required to raise the temperature of one pound of water 1° Fahrenheit; equal to approximately 252 calories. (Also see Joule.)

Buoyant Filter Beads

See Filtration.

Burnt Lime

See Calcium Oxide.

Buta-1,3-diene

See 1,3-Butadiene.

1,3-Butadiene

Formula: $CH_2=CHCH=CH_2$
Synonyms: biethylene, bivinyl, buta-1,3-diene, divinyl, pyrrolylene, vinylethylene
Description: a colourless gas with a mild, aromatic odour; insoluble in water (floats and boils); highly flammable when exposed to heat, flames or powerful oxidizers (emitting acrid fumes); readily polymerizes unless stabilized; may form explosive peroxides when exposed to air; reacts with phenol, crotonaldehyde, and oxidizing agents
Uses: used in the manufacture of many synthetic rubbers and elastomers, ABS resins, plastics, and rocket fuels; also used as a chemical intermediate
Health Hazards: an experimental carcinogen; skin contact can cause frostbite and burns; inhalation may cause coughing, dizziness, dullness, and at high levels, unconsciousness, respiratory failure and death; chronic exposure may be linked to central nervous system disorders and liver disease

By-Product

A material produced during the manufacturing process, in addition to the main product.

C

Cacodylic Acid

See Chorophenoxy Compounds.

Cadmium

Formula: Cd
Description: a soft, ductile, silver-white and blue-tinged metal, or grayish-white powder; insoluble in water, but solubility increases rapidly under mildly acidic conditions; spontaneously flammable in air, will produce dangerous cadmium oxide fumes upon heating; incompatible with strong oxidizers, sulphur, tellurium, and selenium; commonly used compounds include cadmium oxide, cadmium sulphide and cadmium sulphate
Uses: used in electroplating (car parts, nuts and bolts, fasteners, electrical equipment, bearings, tool and machinery parts, military and aerospace components, etc.); also used in soldering and brazing, as a stabilizer for polyvinyl chloride, in battery manufacturing, as a neutron absorber in nuclear reactors, and in the production of paints, pigments, glazes, special alloys, dental amalgams, and pesticides
Health Hazards: acute symptoms (after a delay of 4-10 hours) may include coughing, wheezing, nausea and cramps, chills, dizziness, headache, chest pains and constriction, pulmonary edema, and death; chronic exposure to even low levels may cause kidney and liver damage, emphysema, anemia, bone disease, yellowing of the teeth, shortness of breath, loss of sense of smell, and fatigue; will build up in the body over time; possible carcinogen

Cadmium Oxide

See Cadmium.

Cadmium Sulfate

See Cadmium.

Cadmium Sulfide

See Cadmium.

Caffeine

Formula: $C_8H_{10}N_4O_2$ -HOH
Description: white, heavy masses or long flexible, silky crystals; odourless, with a bitter taste; slightly soluble in water; emits toxic NO_X when heated to decomposition
Uses: general purpose food additive (particularly in coffee, tea and soft drinks); also used in medicines
Health Hazards: experimental carcinogen, mutagen and teratogen; implicated in increased fetal losses and cardiac disorders; attacks central nervous system; large doses cause palpitation, excitement, insomnia, dizziness, headache, and vomiting; continued excessive use may lead to digestive disturbances, constipation, shortness of breath, and depressed mental state

Calcia

See Calcium Oxide.

Calcination

Description: A thermal decomposition process (often undertaken in a cement kiln) which oxidizes the organic components of aqueous liquids or sludges. Volatiles and gases are destroyed or driven off at temperatures ranging from 800° to 2,000°C leaving a residual dry powder or sintered solids that may be suitable for landfilling. The major advantage of calcination is that several operations can be carried out in one step; concentration, destruction and detoxification. The process can be carried out in multiple hearth, rotary kiln or fluidized bed incinerators, that have been equipped with appropriate air pollution control equipment (such as electrostatic precipitators, wet scrubbers, gas adsorbers, etc.).
Wastes Handled: Liquid organic wastes, sludges and slurries are all suitable for calcination. If this is carried out in a cement kiln, wastes may be restricted to those that don't

adversely affect the final product, cement clinker.

Availability: Calcination is a well established process with a number of industrial applications. Many authorities have supported the use of cement kilns or other calcine kilns for the treatment of hazardous wastes. Combustible wastes have been burned in cement kilns as an auxiliary fuel. (Also see Incineration, and Thermal Treatment.)

Calcium Chloride

Formula: $CaCl_2$

Description: water-white to light yellow aqueous solution, or white odourless solid (in flakes, pellets or powder); very soluble (sinks and mixes); not combustible; reacts violently with boric acid and calcium oxide

Uses: used for road building and dust control, road deicing, tire ballasting, oil well cementing, heat transfer brine, a concrete mix additive, waste treatment, and the freeze-proofing of ores, coal or aggregates

Health Hazards: relatively nontoxic; causes irritation of nose and throat; dust may cause reversible corneal injury; calcium chloride solutions may cause superficial burns

Calcium Oxide/Hydroxide

Formula: $CaO/Ca(OH)_2$

Synonyms: burnt lime, calx, calcia, fluxing lime, lime water, oxyde de calcium (Fr.), pebble lime, quick lime/slaked lime

Description: white to grey solid material with no odour; not combustible; CaO reacts violently with water, producing heat and calcium hydroxide; also reacts with moisture and CO_2 in the air; oxidizes organic materials

Uses: used in the iron and steel, pulp and paper, nonferrous smelting, sugar refining industries; also used in uranium recovery, metal flotation, water and sewage treatment, road building, the manufacture of structural blocks and bricks, calcium carbide, soda ash, calcium chloride

Health Hazards: inhalation of dust may cause coughing, sneezing, difficulty breathing, and inflammation of respiratory passages; contact may cause skin irritation, burns and shock; prolonged exposure may cause ulceration, perforation and blindness

Calx

See Calcium Oxide.

CAP

See Clean Air Program.

Carbamates

Description: family of pesticides based upon carbamic acid (NH_2COOH); less persistent in the environment than the chlorinated hydrocarbons

Uses: insecticides include aldicarb (Temik), aminocarb (Matacil), carbaryl (Sevin), carbofuran (Furadan), methomyl (Lannate), oxamyl (Vydate), propoxur (Baygon); herbicides include barban (Carbyne), EPTC (EPTAM), propham (IPC), triallate (Avadex BW); fungicides include maneb, nabam, thiram, zineb

Health Hazards: herbicides present only a mild toxic and irritant hazard to humans and animals, while some of the insecticides may be acutely toxic (they act as chloinesterase inhibitors, disrupting the nervous system); may be inhaled or absorbed across the skin; exposure may result in constriction of pupils, salivation, profuse sweating, lassitude, incoordination, nausea, vomiting, diarrhea, gastric pain, tightness in chest, difficulty breathing, and at high levels, respiratory failure, edema, and convulsions; some appear to be carcinogenic, teratogenic and/or mutagenic; carbamates are actively metabolized by the liver and excreted

Carbamide

See Urea.

Carbamimidic Acid

See Urea.

Carbaryl

See Carbamates.

Carbazotic Acid
See Picric Acid.

Carbinol
See Methanol.

Carbofuran
See Carbamates.

Carbolic Acid
See Phenol.

Carbona
See Carbon Tetrachloride.

Carbon Adsorption
Description: This physical treatment process uses porous activated carbon (a specially treated form of carbon with a high surface area to volume ratio) to adsorb contaminants dissolved in wastewater streams. It relies on the weak physical attractions between contaminant molecules and the charged surface of the carbon. Following treatment, the effluent is often suitable for direct discharge to surface waters or sewers. The process is reversible and adsorbed materials can be removed using thermal, high pH, or solvent-based regeneration techniques. Granular activated carbon (GAC) has been more widely used than powdered activated carbon (PAC) because it is generally easier to regenerate GAC. PAC systems involve suspension of the carbon in a mixing tank and its eventual removal through sedimentation. In GAC applications, wastewaters are passed through a carbon-packed bed or column.
Wastes Handled: Carbon adsorption can be used to remove a wide variety of organic (PCBs, pesticides, PAHs, etc.) and inorganic contaminants (including mercury and other metals). It is most effective in polishing very dilute (less than 0.1%) solutions. The process is most effective in capturing compounds with a high molecular weight, low solubility, low polarity and low degree of ionization.
Availability: Activated carbon is in widespread industrial use for the treatment of off-gases and vapours. In addition, there are several hundred full scale industrial and municipal wastewater installations in operation. Other adsorption systems, including those using lignite coals and clays, are under development. Improved regeneration techniques would further the application of carbon adsorption systems. (Also see Activated Carbon, and Resin Adsorption.)

Carbon Dichloride
See Perchloroethylene.

Carbon Dioxide
Formula: CO_2
Synonyms: anhydride carbonique (Fr.), carbonic acid gas, dry ice
Description: odourless, colourless liquid or gas, or white solid (dry ice); soluble in water (sinks); not flammable, often used to fight fires; reacts violently with diethyl magnesium, lithium, potassium, sodium, and titanium
Uses: used in refrigeration, carbonated beverages, fire extinguishing systems, municipal water treatment, cloud seeding, chemical processing, mining and petroleum production, foundries (for hardening molds), purging tanks and pipelines; as a blowing agent, as a shielding gas (for welding); medicinal uses; to create inert atmospheres; to promote plant growth in greenhouses
Health Hazards: an asphyxiant gas (when insufficient oxygen is present) causing increased respiration, headache, dizziness, drowsiness, shortness of breath, weakness, ringing in ears; solids and liquids can cause freezing injuries and burns

Carbonic Acid Dichloride
See Phosgene.

Carbonic Acid Gas
See Carbon Dioxide.

Carbon Monoxide
Formula: CO
Synonyms: exhaust gas, flue gas, oxyde de carbone (Fr.)

Description: colourless gas or liquid, practically odourless; slightly soluble in water (floats and boils); highly flammable, dangerous explosion risk, burns with a violet flame; reacts violently with a number of compounds
Uses: used in chemical industry, gaseous fuels, metallurgy (special steels, reducing oxides, nickel refining); usually encountered as a waste product or an exhaust gas from internal combustion engines
Health Hazards: combines with hemoglobin cutting the blood's ability to carry oxygen, symptoms include chest pain, confusion, impaired judgement, unconsciousness; liquid may cause frost bite; chronic exposure may affect hearing, vision.

Carbon Oil

See Benzene.

Carbon Oxychloride

See Phosgene.

Carbon Sorption

See Carbon Adsorption.

Carbon Tetrachloride

Formula: CCl_4
Synonyms: benzinoform, carbona, perchloromethane, tetrachloromethane
Description: colourless, sweet-smelling liquid; vapour 4.3 times heavier than air; highly volatile; insoluble in water (sinks); incompatible with many substances including chemically-active metals; not combustible
Uses: 20.1 kilotonnes used each year mainly for making fluorochloromethanes; also used as metal degreaser, fumigant, solvent (fats, oils, rubber, waxes, resins), drying agent; used in production of chemicals and semiconductors
Health Hazards: highly toxic; malaise, headache, nausea, dizziness, confusion; narcotic effect leading to unconsciousness and death; damage to gastrointestinal tract, central nervous system, kidney, liver, lungs; irritates eyes and dries skin; suspected human carcinogen.

Carbonyl Chloride

See Phosgene.

Carbonyl Diamide

See Urea.

Carbonyl Diamine

See Urea.

Carbophenothion

See Organophosphates.

Carboxide

See Ethylene Oxide.

Carbyne

See Carbamates.

Carcinogenic

A contaminant deemed capable of causing cancer or increasing the risk of cancer in humans or animals exposed to it by ingestion, inhalation or skin contact.

CARI

Canadian Association of Recycling Industries.

Carrel-Dakin Solution

See Sodium Hypochlorite.

Cartridge Filters

See Filtration.

Catalysis

Description: chemical additive that promotes a reaction by causing it to proceed more quickly or under less severe temperature or pressure conditions.
Availability: used in a number of waste treatment processes, including reduction/oxidation, hydration, dechlorination, cyanide and pesticide destruction, dehydration, hydrolysis, isomerization, and dehydrogenation.

Catalyst

A substance that changes the rate of a chemical reaction but is not changed itself in the course of the reaction. (Also see Catalysis.)

Cation
A positively charged ion.

Caustic Potash
See Potassium Hydoxide.

Caustics
Strong alkalis (e.g., sodium hydroxide which burns or corrodes organic tissue).

Caustic Soda
See Sodium Hydroxide.

CCOHS
Canadian Centre for Occupational Health and Safety.

Cd
See Cadmium.

CE
See Combustion Efficiency.

Cell
In the context of waste management, a cell refers to as deposit of waste in a landfill which, when filled, is sealed off from the air and other wastes.

Centralized Facility
As used by the OWMC, a waste treatment and disposal facility which has all the components (i.e. the incineration, physical/chemical treatment, solidification, and solid residue disposal) on a single site.

Centrifugation
Description: Centrifugal force is used to mechanically separate suspended solids or immiscible liquid components from an aqueous waste stream. If the waste is highly concentrated, centrifugation is a faster, more efficient separation process than gravity (see Sedimentation/Precipitation). Centrifuges come in two main types: sedimentation and filtration. Configurations include tubular disc, conveyor bowl, vertical basket, and conical screen and pusher types.
Wastes Handled: The process is generally used to concentrate dilute sludges (from 2-5% solids up to 15-50%), or to separate liquids with different densities.
Availability: In wide use, centrifugation is used to separate oil and water mixtures, dewater sludges, remove particles and solids from wastewaters, and many other applications.

CEPA
Canadian Environmental Protection Act.

CFCs
See Chlorofluorocarbons.

Chemical Dechlorination
Description: The dechlorination (or dehalogenation) process is used to strip chlorine atoms from highly toxic chlorinated compounds A low-temperature, exothermic reaction between a highly reactive alkali (such as a sodium or potassium compound) and a chlorinated organic fluid produces a non-toxic organic residue, an inorganic salt and a treated liquid.
Wastes Handled: Chemical dechlorination systems are used to detoxify chlorinated hydrocarbons, such as PCBs, pesticides and other toxic compounds found in organic liquids, such as oils.
Availability: A number of patented PCB and dioxin decontamination systems employing chemical dechlorination are currently offered by waste service companies in Canada and the U.S..

Chemical Extraction
See Liquid-Liquid Extraction.

Chemical Fixation
In general, a chemical treatment by which waste is altered so that its final leaching characteristics will be acceptable after disposal in a landfill. (Also see Solidification/Stabilization.)

Chemical Oxidation
See Oxidation (Chemical).

Chemical Oxygen Demand (COD)

A means of measuring the pollution strength of domestic and industrial wastes based on the fact that all organic compounds, with few exceptions, can be oxidized by the action of strong oxidizing agents under acid conditions to carbon dioxide and water.

Chemical Precipitation

(1) Contaminant (e.g., heavy metals, fluoride) precipitation induced by addition of chemicals; or (2) the process of softening waters by the addition of lime or lime and soda ash as the precipitants. (Also see Sedimentation/Precipitation.)

Chemical Reduction

See Reduction (Chemical).

Chemical Risk Assessment

The scientific process used to estimate quantitatively the toxic properties of a chemical and the conditions of human exposure to it, both to ascertain the likelihood that exposed humans will be adversely affected and to characterize the nature of the effects they may experience. (Also see Risk.)

Chemical Treatment

See Physical/Chemical Treatment

Chinese White

See Zinc.

Chloor, or Chlor

See Chlorine.

Chlorate de Sodium

See Sodium Chlorate.

Chlorate of Soda

See Sodium Chlorate.

Chlordane

See Chlorinated Hydrocarbons.

Chlore

See Chlorine.

Chlorfenvinphos

See Organophosphates.

Chlorinated Dioxin

See Dioxins.

Chlorinated Hydrocarbons

Synonyms: organochlorine compounds
Description: a family of pesticides (most are insecticides) all of which contain chlorine, carbon and hydrogen (some may contain oxygen and sulphur); many of these compounds have a high persistence in soil, food and feed, and tend to accumulate in fatty tissues
Uses: products include aldrin, benzene hexachloride (BHC), chlordane, chlorodecone (Kepone), DDT, dicofol (Kelthane), dieldrin, endosulfan (Thiodan), heptachlor, lindane, methoxychlor (Marlate), perthane, toxaphene; because of environmental concerns, many of these compounds are no longer widely used in Canada
Health Hazards: while most chlorinated hydrocarbons exhibit low to medium toxicity, some are highly dangerous neurotoxins attacking the central nervous system, kidneys and liver; may be absorbed across skin or inhaled, and build up in the body; mild exposure may cause hyper-irritability, headache, fatigue, loss of appetite, nausea, and vomiting, serious intoxication may involve trembling, convulsions, coma, respiratory failure, and death; solvents in formulations may cause skin irritation or sensitivity after repeated exposures; long-term use may result in anorexia/weight loss, headache and nervousnous

Chlorination

Treatment of water or wastewater by addition of chlorine as a disinfectant.

Chlorine

Formula: Cl
Synonyms: bertholite, chloor, chlor, chlore, cloro
Description: a greenish-yellow gas (or an amber liquid under pressure) with a pungent,

irritating odour; when spilled in water, liquid chlorine sinks and boils; nonflammable, but will support combustion; many metals ignite in the presence of chlorine; acts as an oxidizer with many organic materials, and reacts violently with turpentine, ether, ammonia, hydrocarbons, finely divided metals, and other flammables; will react with carbon monoxide to produce dangerous phosgene gas, and water to produce corrosive hydrochloric fumes
Uses: used as a bleaching agent in the pulp and paper industry, and in the production of ethylene dichloride; also used in mining and smelting, water treatment plants, and the production of a number of chemical products including hydrogen chloride, aluminum chloride, propylene oxide and chlorinated solvents
Health Hazards: inhalation may cause irritation of the mucous membranes and eyes, sneezing, coughing, difficulty in breathing, headache, nausea, weakness, anxiety, respiratory distress, pulmonary edema, and death; lingering effects of high exposure may include tuberculosis, pleurisy, pneumonia, and bronchitis; skin contact can result in inflammation, blistering, eye irritation, and loss of sight; chronic exposure may have a slight effect on respiratory function

Chlorinolysis

Description: Process used to convert long-chain chlorinated hydrocarbons into shorter chain hydrocarbons (usually carbon tetrachloride). The process breaks the carbon bonds with high heat (500°C) and pressure (up to 200 atmospheres), and uses excess chlorine to generate the carbon tetrachloride. The effluents, which include phosgene gas, must be treated prior to discharge.
Wastes Handled: The process will handle most chlorinated hydrocarbons in liquid, emulsion or slurry form.
Availability: This is essentially a manufacturing process that uses a waste stream as a raw material. Its utilization is dependent on the market for carbon tetrachloride.

Chlorodecone

See Chlorinated Hydrocarbons.

Chlorodifluoromethane

See Chlorofluorocarbons.

Chlorodiphenyls

See Polychlorinated Biphenyls.

Chloroethene

See Vinyl Chloride.

Chloroethylene

See Vinyl Chloride.

Chlorofluorocarbons

Synonyms: CFC, fluorocarbon, fluorochloromethane, Freon, Genetron, propellant, refrigerant, Ucon
Description: a family of colourless, nearly odourless gases, made up of carbon, fluorine, chlorine and hydrogen atoms; insoluble in water (they sink and boil); nonflammable, although highly toxic chlorides and fluorides are released when CFCs are heated to decomposition; common CFCs include chlorodifluoromethane (ClF_2CH), chlorotrifluoromethane (ClF_3C), dichlorodifluoromethane (Cl_2F_2C), dichlorofluoromethane (Cl_2FCH), trichlorofluoromethane (CCl_3F)
Uses: used as aerosol propellants, blowing agents (in the production of foams and packaging), refrigerants, low-temperature solvents, dielectric gases; also used in fire extinguishers, as chemical intermediaries, in pharmaceutical processing, and in hardening of metals
Health Hazards: very high concentrations can attack lungs, central nervous system, heart, liver, kidneys and spleen; inhalation may cause stimulation/depression, loss of co-ordination, nausea, vomiting and death; contact may cause defatting of skin; liquid may also cause frostbite, irritation, dermatitis; usage being controlled because of CFCs' depleting effect on ozone layer

Chloroform

Formula: $CHCl_3$

Synonyms: chloroforme (Fr.), formyl trichloride, Freon 20, methane trichloride, methenyl trichloride, trichloroform, trichloromethane

Description: clear, colourless liquid with a characteristic ethereal odour and a sweet taste; slightly soluble in water (sinks); not flammable, but decomposes at high temperatures to produce phosgene and hydrochloric gases; reacts violently with acetone and a base, aluminum, lithium, nitrogen tetroxide, potassium, and sodium; dissolves rubber and plastics

Uses: used in the production of pharmaceuticals, fluorocarbons, plastics, floor polish, artificial silk, and fumigants; also used as a solvent (especially in the lacquer industry); the use of chloroform in medicine has been largely abandoned because of its toxic effects

Health Hazards: this well known anesthetic is also a suspected human carcinogen and experimental teratogen; irritating to the skin and mucous membranes (prolonged contact may cause burns); inhalation of high concentrations may cause narcosis, shock, coma and cardiac failure; prolonged exposure may damage the liver, heart and kidneys

Chloroforme

See Chloroform.

Chloroformyl

See Phosgene.

Chlorohydric Acid

See Hydrochloric Acid.

Chlorolysis

Hazardous waste chemical treatment method by which chlorinated organic compounds are recycled and converted into useful industrial products through the addition and mixing of excess chlorine to the organic waste. (Also see Chlorinolysis.)

Chlorophenothane

See DDT.

Chlorophenoxy Compounds

Description: family of widely-used herbicides, their structure is characterized by a phenol ring to which are attached a number of chlorine atoms and organic acids; some products may be contaminated with trace amounts of toxic by-products (such as dioxin); some forms are quite volatile and may drift on application

Uses: herbicides include cacodylic acid, dichlorophenoxyacetic acid (2,4-D), dichlorprop (Estaprop), mecoprop, MCPB (Tropotox), MCPA (Herbitox, Methoxone), 2,4,5-T

Health Hazards: relatively low to moderate toxicity; may be inhaled or absorbed across skin; symptoms include weakness and lethargy, headache, double vision, anorexia, diarrhea, muscle weakness (particularly in chewing and swallowing); high doses may cause fevers, convulsion, cardiac arrest and death; some compounds are moderately irritating to the skin, eyes, respiratory tract and gastro-intestinal lining; not stored in fat to any significant degree, usually excreted in urine in hours or, at most, days

Chloros

See Sodium Hypochlorite.

Chlorotrifluoromethane

See Chlorofluorocarbons.

Chlorox

See Sodium Hypochlorite.

Chlorpyrifos

See Organophosphates.

Chlorure de Methylene

See Methylene Chloride.

Chlorure de Vinyle

See Vinyl Chloride.

Chlorure Ferrique
See Ferric Chloride.

Chromates
See Chromium.

Chromic Acid
See Chromium.

Chromic Oxide
See Chromium.

Chromic Oxide Green
See Chromium.

Chromic Sulphate
See Chromium.

Chromium Compounds
Formula: Cr
Description: three major forms: chromium metal, trivalent compounds (chromic oxide green, chromic oxide, iron chromite, chromic sulphate), and hexavalent compounds (chromic acid, and a number of chromates and dichromates); hexavalent chromium is a more hazardous form of chromium than trivalent compounds; insoluble to very soluble in water; generally a very dangerous fire and explosion risk (generating toxic fumes on decomposition); most chromium compounds are strong oxidizers
Uses: chromium metal is used in stainless steel, ferrochrome and other alloys; trivalent compounds used in ceramics, glass making, tanning, and refractory brick; hexavalent compounds used in paints and pigments, electroplating, lithography, etching and engraving, and printing
Health Hazards: corrosive effect on skin and mucous membranes (particularly the nose), causing dermatitis, discolouration of the skin, allergic reactions, lesions and ulcers, nosebleeds and holes in the nasal septum, watering and irritation of the eyes; inhalation may cause wheezing and coughing, nausea, vomiting, headache, burning in the throat, nose and eyes, shortness of breath, pain in breathing, fever, coma and death; chronic symptoms include weight loss, dental erosion, liver damage and asthmatic bronchitis; many compounds are human and experimental carcinogens of the lungs, nasal cavity, sinus, stomach, and larynx

Chronic Exposure
Exposure of long-term duration. (Also see Acute Exposure, and Subchronic Exposure.)

Chronic Health Effects
Long-term effects or those that are revealed after the elapse of some time, such as cancer, from a one-time or a repeated exposure to a substance. (Also see Acute Health Effects.)

Chrysotile
See Asbestos.

C.I.77575
See Lead.

Cinnamene
See Styrene.

Cinnemenol
See Styrene.

Circosol
See Naphtha.

Circulating Bed Combustion (CBC)
Description: A variation on the fluidized bed incineration technology, CBC incineration uses high air velocity and circulating solids to create a turbulent combustion zone for the efficient destruction of toxic organics. Wastes, limestone (to neutralize acid gases) and recirculating bed material are fed into the combustion loop. The resultant mixing, and resultant high heat transfer efficiencies, allows a lower combustion temperature (870°C) and minimizes the generation of nitrogen oxides and carbon monoxide.
Wastes Handled: CBC systems can handle chlorinated hydrocarbons and other organic gases, liquids, sludges and contaminated solids.

Availability: Field scale and pilot plant CBC units are under study in the U.S. (Also see Fluidized Bed Combustion, Incineration, and Thermal Treatment.)

Cl

See Chlorine.

Clarification

A process or combination of processes to reduce the concentration of suspended matter in a liquid. (Also see Sedimentation/ Precipitation, and Flocculation.)

Clean Air Program (CAP)

An initiative by the Ontario government in controlling air emissions. The proposal was introduced in 1988 under Ontario Regulation 346 of the Environmental Protection Act. The use of dispersion will be replaced by controlling an emission at its source before it escapes into the atmosphere.

Cleaning Solvents

See Naphtha.

Clean-Up

The restoration of a contaminated site to ensure the protection of human health and the environment.

Cloro

See Chlorine.

Clorox

See Sodium Hypochlorite.

Coagulation

The destabilization and initial aggregation of colloidal and finely divided suspended matter in aqueous wastes by adding a floc-forming substance, typically alum. (Also see Flocculation and Sedimentation/Precipitation.)

Coal Naphtha

See Benzene.

Coal Tar

Synonyms: estar, lavatar, pixalbol, zetar

Description: black viscous liquid (or semi solid), with naphthalene-type odour and sharp burning taste; flammable, dangerous fire risk; only slightly soluble in water; coal tar is distilled to produce (1) light oil, (2) middle oil, (3) heavy oil, (4) anthracene oil, and (5) pitch. (Also see Naphtha.)

Uses: raw material for plastics, solvents, dyes, drugs, and other organic chemicals; crude or refined fractions are also used for waterproofing, paints, pipe coatings, roads, roofing, insulation, pesticides, sealants

Health Hazards: components include benzene, toluene, xylenes, naphthalene, phenol, cresols, and PAHs; volatile components (anthracene, phenanthrene, acridine) are carcinogens

Coal Tar Naphtha

See Naphtha.

C of A

Certificate of Approval.

Coke Tray Aerator

See Air Stripping.

Coliform

Bacteria in human and animal feces. Their presence in water indicates pollution and bacterial contamination.

Colloid

A non-settling suspension of fine particles, larger than molecules but smaller than visible particles, which are not easily filtered.

Colloidal Manganese

See Manganese.

Colloidal-S

See Sulphur.

Cologne Spirit

See Ethyl Alcohol.

Colsul

See Sulphur.

Combat Gas

See Phosgene.

Combustion Efficiency (CE)

A measure of completeness of energy release from carbonaceous fuels and their relative conversion to carbon monoxide and carbon dioxide. CE = $[CO_2/(CO_2+CO)] \times 100\%$.

Combustion Zone

The portion of the internal capacity of an incinerator where the gas temperatures of the materials being burned are within 100° C of the specified operating temperature.

Combustion Zone Temperature

The temperature maintained inside the burning area of an incinerator; one of the most important factors for maintaining proper incineration of hazardous waste.

Commercial Chemical Waste

A waste which is a commercial chemical product or manufacturing chemical intermediate of a specified generic name and includes:

(a) an off-specification commercial chemical product or manufacturing chemical intermediate which, if it met specifications, would have the specified generic name; or

(b) residues or contaminated material from the clean-up of a spill of a commercial product or manufacturing chemical intermediate of the specified generic name or of an off-specification commercial chemical product or manufacturing chemical intermediate which, if it met specifications, would have the specified generic name; or

(c) an empty container or the liner from any empty container that contained a commercial chemical product or manufacturing chemical intermediate of the specified generic name, or an off-specification commercial chemical product or manufacturing chemical intermediate which, if it met specifications, would have the specified generic name, or residues or contaminated materials from the clean-up of a spill of any of them, unless the empty container or the liner from the empty container has been triple rinsed;

but, except as specified in subsections a), b) or c), does not include a waste stream or waste material in which material of the specified generic name is present.

Common Salt

See Sodium Chloride.

Compaction Test

A laboratory compacting procedure to determine the optimum water content at which a soil can be compacted so as to yield the maximum density (dry unit weight). The method involves placing (in a specified manner) a soil sample at a known water content in a mould of given dimensions, subjecting it to a compacting effort of controlled magnitude, and determining the resulting unit weight. The procedure is repeated for various water contents sufficient to establish a relation between water content and unit weight. The maximum dry density for a given compacting effort will usually produce a sample whose saturated strength is near maximum.

Compatibility

The ability of materials (i.e. waste materials, reagents or liners) to coexist without adverse environmental effects or health and safety risks. (Also see Incompatible Waste.)

Complete Mix

See Activated Sludge

Composting

Description: The environment inside the compost pile is carefully controlled (including moisture, temperature, pH, and nutrient levels) to encourage the biodegradation of organic wastes by aerobic micro-organisms (anaerobic digestion may be used for some wastes). Odours and leachate must be carefully managed. This biological process is similar to landfarming, but the retention time is usually much shorter (a matter or weeks rather than months). Available systems are of two main types: static pile composting (air is mechanically piped into the pile), and windrow composting (the wastes are turned on a regular basis).

Wastes Handled: Most organic materials, including pesticides, explosives, tars and industrial sludges, may be composted. Dilute liquid wastes may need to be mixed with a bulking agent to reduce the moisture content and improve their manageability. Composting has been used to treat contaminated soils.

Availability: While composting systems have been used to treat sewage sludge for years, industrial applications are rare. (Also see Bioremediation, Enzyme Treatment, and Landfarming.)

Condensate

The liquid produced by condensation, a process which converts a gas or vapour to its liquid form.

Consolidation

The gradual reduction in volume and increase in density of a soil mass in response to increased load or effective compression (e.g., the squeezing of fluids from pore spaces).

Constraint Mapping

A method of analysis that involves: identification of factors that may pose constraints to development, the collection of those data, the mapping of data on "constraint maps", and the identification of areas not excluded by constraints shown on the maps.

Contact Stabilization

See Activated Sludge

Contaminant

Any solid, liquid, gas, odour, heat, sound, vibration, radiation or combination of any of them resulting directly or indirectly from the activities of man which may: (1) impair the quality of the environment and affect the public trust therein for any use that can be made of it; (2) cause injury or damage to property or the plant or animal life; (3) cause harm or material discomfort to any person; (4) adversely affect the health or impair the safety of any person; or (5) render any property or plant or animal life unfit for use by man.

Contaminant Loading

Total quantity of the specific contaminant in the waste, solidified material or emissions.

Contaminant Migration

The ability of a contaminant to move from its source through air, water or soil.

Contaminant Pathway

A route of exposure of contaminants to humans. Examples are air (inhalation of contaminants), surface water (ingestion or skin absorption) and groundwater (ingestion).

Contamination

See Pollution, and Contaminant.

Contingency Plan

A document setting forth an organized, planned, and coordinated course of action to be followed in order to prevent the accidental release of materials, and limit potential adverse effects in case of fire, explosion, or discharge of hazardous waste constituents which could threaten human health and the environment.

Controlled Evaporative Water Cooling (Dry Bottom Cooling Tower)

A means of cooling flue gas wherein a controlled amount of liquid, based on the gas temperature drop desired, is introduced into the flue gas stream and completely evaporated such that no free moisture remains. The liquid may be either fresh water or process effluent, e.g., scrubber blowdown. The gas weight entering the cooling tower is increased by an amount equal to the quantity of moisture evaporated.

Convective Heat

Heat transferred by convection. Convection is the transfer of heat via the movement of substances which absorb heat by physical contact with a higher temperature source and transfers it by physical contact to a lower temperature receiver.

Copper

Formula: Cu
Synonyms: bronze powder, gold bronze, miedz
Description: a reddish metallic solid or powder, with no odour; insoluble in water (sinks); inflammable, although dust is combustible and may explode; reacts violently with acetylene, ammonium nitrate, bromates, chlorates, chlorine, ethylene oxide, fluorine, hydrogen peroxide, hydrogen sulphide, and iodates; toxic copper compounds include cupric acetate, cupric acetoarsenite, cupric chloride, cupric nitrate, cupric oxalate, cupric sulphate, cupric tartrate
Uses: excellent electrical conductor (used in wiring, switches, etc.); also used in plumbing, heating, roofing and building construction; alloys (brass, bronze, etc.) and electroplated protective coatings; in insecticides, antifouling paints, and as insulation for liquid fuels
Health Hazards: dust irritates nose, upper respiratory tract, and may damage cornea; a number of copper compounds may cause allergic reactions; fumes may leave a metallic taste in the mouth, and cause nasal congestion, digestive upset and nausea, metal fume fever; animal experiments have shown damage to liver, pancreas, lung cells, nervous system and kidneys; toxic levels of copper may build in the body if a person has Wilson's disease

Corrosive

Refers to highly acidic or highly alkaline (caustic) substances which wear other substances away by chemical reaction. They may produce chemical burns on contact with human or animal tissues.

Counter

See Organophosphates.

Cover Material

Generally, some type of soil compacted in layers over refuse in order to minimize infiltration of precipitation that would leach through refuse. (Also see Landfilling.)

Cr

See Chromium.

Criterion Dose

The lowest safe systemic dose.

Crocidolite

See Asbestos.

Cross-Flow Tower Air Stripper

See Air Stripping

Crystex

See Sulphur.

Cu

See Copper.

Cupric Acetate

See Copper.

Cupric Acetoarsenite

See Copper.

Cupric Chloride

See Copper.

Cupric Nitrate

See Copper.

Cupric Oxalate

See Copper.

Cupric Sulphate

See Copper.

Cupric Tartrate

See Copper.

CWME

Canadian Waste Materials Exchange.

Cyanide Oxidation

Conversion of cyanide into nitrogen and carbon dioxide either by the addition of an oxidizing agent or by electrolysis.

Cyanides

Formula: KCN and NaCN
Synonyms: potassium cyanide and sodium cyanide; also see Hydrogen Cyanide
Description: white solids with a faint almond-like odour and a bitter, burning taste; soluble in water (sinks and mixes); not combustible, but may emit toxic fumes when heated; can react with strong oxidizers such as nitrates, chlorates, acids, and acid salts
Uses: used in the extraction of ores, electroplating, metal treatment (silver and metal polishes), various manufacturing processes, and as insecticides and fumigants
Health Hazards: attacks the liver, kidneys, skin, central nervous system and cardiovascular system; symptoms include weakness, headache, confusion, nausea, vertigo, skin and eye irritations (including a "cyanide rash"), slow gasping respiration; readily absorbed by skin and lungs; death caused by respiratory arrest

Cyanoethylene

See Acrylonitrile.

Cyclohexane

Formula: $(CH_2)_6$
Synonyms: hexahydrobenzene, hexamethylene, hexanaphthene
Description: clear colourless liquid with a pungent, aromatic odour; insoluble in water (floats); flammable; can react with strong oxidizing agents, reacts violently with nitrogen dioxide
Uses: used in manufacture of nylon, and chemical synthesis; also used as a solvent (for cellulose ethers, fats, oils, resins, waxes, etc.), paint and varnish remover, and fungicide
Health Hazards: depresses the central nervous system causing excitement, loss of equilibrium and stupor; inhalation may also result in headache, nausea, vomiting, dizziness and unconsciousness; prolonged contact dries skin; may irritate eyes

Cyclohexanone

See Ketones.

Cyclohexatriene

See Benzene.

Cyclon

See Hydrogen Cyanide.

Cyclone

Any cone-shaped cleaning apparatus that is used in particle collecting and fine grinding operations. Cyclones operate on the principle of centrifugal separation (see Centrifugation).

Cyclone B

See Hydrogen Cyanide.

Cyclosol

See Naphtha.

Cygon

See Organophosphates.

Cynthion

See Organophosphates.

Czterothlek Olowiu

See Tetraethyl Lead.

D

2,4-D
See Chorophenoxy Compounds.

Dakin Solution
See Sodium Hypochlorite.

Dangerous Goods
Means any product, substance or organism included by its nature or by the regulations in any of the classes listed in the schedule of the *Ontario Dangerous Goods Transportation Act, 1981*, and the federal *Transportation of Dangerous Goods Act (1980).*

2,4-DB
See Chorophenoxy Compounds.

DDT
Formula: $(ClC_6H_4)_2CHCCl_3$
Synonyms: chlorophenothane, dichlorodiphenyltrichloroethane, dicophane, ENT 1506, Gesarol, Guesarol, Neocid
Description: colourless crystals or off-white powder, either odourless or with a slight aromatic smell; insoluble in water; will decompose if heated, releasing very toxic chlorine fumes; not compatible with alkaline materials. (Also see Chlorinated Hydrocarbons.)
Uses: a broad spectrum pesticide/insecticide (although now banned for most uses)
Health Hazards: absorbed readily from intestinal tract or lungs; not biodegradable, accumulating in the body's fatty tissues; long term effects unknown; experimental carcinogen and mutagen; high doses may cause irritation of lips, tongue and face, nausea, vomiting, headache, fatigue, tremor, dizziness, and convulsions. (Also see Chlorinated Hydrocarbons.)

Dechlorane
See Mirex.

Dechlorination
See Chemical Dechlorination.

Decommissioning
The mothballing, partial or complete closure of a facility in a safe and environmentally acceptable manner.

Decomposition
A change in the composition of matter as a result of the action of agents, such as microorganisms, heat, light or chemical substances, which break down the matter into simpler forms.

Decontamination
The process of making any person, object, or area safe by absorbing, destroying, neutralizing, or rendering harmless by removing the contaminating agents. (Also see Contaminant, and Pollution.)

Dedicated High Solids Treatment
As used by OWMC, a solidification system located in an incineration plant to solidify boiler ash and salt/fly ash from the flue gas treatment system.

Dedicated Outfall
As used by OWMC, a pipeline outlet into a water body used solely for treated effluent.

Deep Well Disposal
Description: Liquid or treated hazardous wastes are injected into the pores of deep permeable subsurface strata at depths of 300 to 3,600 meters, using gravity injection or high pressure pumps (although the latter technique is apparently being regulated out of use).
Wastes Handled: Pumpable liquid wastes, including acids, bases, alcohols, solvents and salts, may be disposed of in deep wells. Wastewaters may need to be pretreated to remove large solids.
Availability: Used extensively since the 1950s in the oil and gas industry (for the disposal of brines and other industrial wastes), deep well

injection is common in Western Canada. However, possible groundwater contamination problems may limit its use in the future. (Also see Disposal, and Underground Disposal.)

Degradation

Decomposition of high molecular weight materials into lower molecular weight materials.

Dehalogenation

See Chemical Dechlorination.

Demeton

See Organophosphates.

Demineralization

Removal of mineral constituents from water.

Demister

An air pollution control device for removing fine water droplets (mist) from gaseous emissions.

Demulsify

To separate liquid-liquid emulsions into two distinct liquid phases.

Denatured Alcohol

See Ethyl Alcohol.

Denitrification

A biological reduction process to convert nitrates or nitrites to nitrogen gases. It is commonly done in an anaerobic environment; bacteria commonly used include pseudomonas, micrococcus, archromobacter and bacillus. (Also see Anaerobic Digestion, and Nitrification.)

Dense Non-Aqueous Phase Liquids (DNAPL)

Liquids which are more dense than water and do not contain water (e.g., perchloroethylene, a common dry cleaning solvent).

Dermatitis

Inflammation of the skin.

Dessication Crack (Fracture)

Crack formed by shrinkage of clay or clay-type beds in the course of drying under the influence of the sun's heat.

Destruction and Removal Efficiency (DRE)

A term introduced by the U.S. Environmental Protection Agency to measure the capability of an incineration system to destroy and remove certain predetermined organic chemicals. DRE relates the amount of a chemical fed to an incinerator to the amount of the same chemical leaving the incinerator through the stack. (Also see Principal Organic Hazardous Constituents, and Surrogate Chemical.)

Destruction Efficiency (DE)

A measure of how completely an original constituent in the waste feed is destroyed by combustion.

Detention Pond

The temporary storage of excess run-off on, below or above the surface of the earth for the purpose of attenuating excess run-off.

Detonation

Extremely rapid, self-sustaining decomposition of an explosive material. May be initiated by mechanical impact, heat or chemical reaction.

Detoxification

Removal of poisonous substances.

Dewatering

A physical process which removes water from sludge so that its physical form is changed from essentially that of a fluid to that of a slurry or damp solid.

Dew Point

The temperature at which water vapour begins to condense.

Dialysis

Description: Dialysis involves the transfer of small solute molecules from a waste stream across a semi-permeable membrane and into a counter-current wash stream. The transfer is driven by the concentration gradient between the contaminated waste stream and the wash stream, and is influenced by temperature, membrane characteristics and surface area. Both the treated feed stream and the resultant wash stream may be designated for re-use or recovery.
Wastes Handled: Liquid wastes containing salts and small organic species may be treated using dialysis. Higher molecular weight compounds and colloids are concentrated in the waste stream.
Availability: Commercially available; dialysis has been used to treat industrial brines and to recover caustic soda in the textile industry. (Also see Electrodialysis, Microfiltration, Reverse Osmosis, and Ultrafiltration.)

Diatomaceous Earth

Soft, bulky solid material (88% silica) composed of the skeletons of small prehistoric aquatic plants related to algae.

Diazinon

See Organophosphates.

1,2-Dibromoethane

See Ethylene Dibromide.

Dibromure d'Ethylene

See Ethylene Dibromide.

Dichlorodifluoromethane

See Chlorofluorocarbons.

Dichlorodiphenyltrichloroethane

See DDT.

1,2-Dichloroethane

See Ethylene Dichloride.

Dichlorofluoromethane

See Chlorofluorocarbons.

Dicloromethane

See Methylene Chloride.

Dichlorophenoxyacetic Acid

See Chorophenoxy Compounds.

Dichlorprop

See Chorophenoxy Compounds.

Dichromates

See Chromium.

Dicofol

See Chlorinated Hydrocarbons.

Dicophane

See DDT.

Dieldrin

See Chlorinated Hydrocarbons.

Dielectric

Insulating or non-conductive substance.

Diesel Exhaust

Description: diesel engines produce 20 to 100 times more soot than gasoline-powered engines; pollutants attached to these dust particles (which may be sucked deep into the lungs) include PAHs, aldehydes, ketones, benzenes and peroxides; toxic gases include nitrogen and sulphur oxides, carbon dioxide and carbon monoxide
Health Hazards: exposed workers have reported difficulty breathing, coughing/wheezing problems, chronic phlegm, and cardio-vascular disease; exhaust contains many poorly-understood toxics, including a number of suspected carcinogens and mutagens

Diethyleneimide Oxide

See Morpholine.

Diethylene Oximide
See Morpholine.

Diethyl Ketone
See Ketones.

Diffused Air Basin
See Air Stripping.

Diffusion
Migration of molecules, atoms or ions as a result of their own random movements from a region of higher concentration to a region of lower concentration.

Dihydrooxirene
See Ethylene Oxide.

1,2-Dihydroxyethane
See Ethylene Glycol.

Dike
An embankment of natural or man-made materials constructed to contain or obstruct the movement of liquids, sludges, or other substances. (Also see Berm.)

Dilution
Increasing the proportion of solvent to solute in any solution and thereby decreasing the concentration of solute per unit volume.

Dimethoate
See Organophosphates.

Dimethylbenzene
See Xylene.

Dimethyl Carbinol
See Isopropyl Alcohol.

Dimethylene Oxide
See Ethylene Oxide.

Dimethylmethane
See Propane.

Dinitrogen Tetroxide
See Nitrogen Oxides.

Dioxins
Description: family of organic chemical compounds; there are 75 different forms (or isomers), each with distinct physical, chemical and biological properties, that are characterized by the placement of 1-8 chlorine atoms and their aromatic rings; tetrachlorodibenzo-p-dioxin (TCDD), a highly toxic and highly persistent compund, is the most widely publicized and studied dioxin. (Also see Furans.)
Uses: found as an unwanted contaminate in various chlorophenols/phenoxy compounds, such as pesticides (2,4-D), wood preservatives (pentachlorophenol), and defoliant mixes (agent orange)
Health Hazards: TCDD is a carcinogen, mutagen and teratogen; its effects vary widely in animal experiments, although it can be extremely toxic in very low doses

Diphenylmethane Diisocyanate
See Methyl Isocyanate.

Diphenyltrichoroethane
See DDT.

Dipping Acid
See Sulphuric Acid.

Disc Filters
See Filtration.

Discharge Regulations
Regulations set by the governing body on the level of contaminants allowed in the discharge stream.

Disinfection
Effective killing by chemical or physical processes of all organisms capable of causing

infectious disease. Chlorination is the disinfection method commonly employed in sewage treatment.

Disposal

Description: Disposal involves releasing back into the environment, albeit in a controlled manner, liquid, solid or gaseous wastes, the residues of waste treatment processes. Landfilling has been the traditional method of disposing of non-hazardous industrial wastes. Currently, the bulk of Ontario's liquid industrial wastes are discharged to municipal sewers for biological treatment prior to direct discharge to rivers or lakes. Some wastes are burned in on-site or commercial incinerators and released to the atmosphere. Landfarming, deep well disposal, ocean dumping, and direct discharge to land/air/surface water have also been utilized, but to a lesser extent. Environmental concerns about the effects of toxic leachates and off-gases have limited the disposal options for hazardous wastes unless they are pretreated. Pretreatment may involve mixing, immobilization, detoxification and/or volume reduction. Long-term storage (either above or below ground) may be thought of as a retrievable disposal technique.

Wastes Handled: Most inert, non-hazardous wastes can be disposed of safely if the proper safeguards and security measures are implemented.

Availability: See Above-Ground Storage, Deep Well Disposal, Landfilling (Secure Chemical), Landfilling (Municipal), Ocean Dumping, Underground Storage.

Dissolution

Description: A physical (dissociation) or chemical reaction (ionization, oxidation, etc.) is used to dissolve a solid into a liquid. Solids are contacted by a solvent in a mixing vessel (dissolution may be improved if the solid is first ground up), following which any undissolved material is separated. Different reagents may be used to remove solids sequentially and heat may be applied to speed the process. The wastewater stream may require further treatment, while the residual solids may be recycled/recovered.

Wastes Handled: Dissolution is widely used to recovery metals from ores. It may have application in the treatment of fly ashes and flue dusts.

Availability: Commercially available as processing technology.

Dissolved Air Flotation (DAF)

See Flotation.

Dissolved Oxygen

Oxygen dissolved in water.

Distillation

Description: Distillation is a non-destructive separation technique that involves heating aqueous mixtures, in stages, to sequentially separate the liquid with the lowest boiling point. Vapours are then cooled and condensed. The remaining liquids are removed in subsequent steps. Vacuum distillation units use lower pressures to facilitate evaporation.

Wastes Handled: Distillation is used to recover waste oils, spent solvents, mercury vapours and a variety of organic chemicals. Viscous wastes or those containing a heavy load of solids have a tendency to clog distillation systems. Distillation may be too energy intensive for the treatment of very dilute wastewaters.

Availability: An established commercial technology, a number of small-scale batch distillation systems are on the market for cleaning contaminated solvents. More complex mixtures of wastes must be fractionally distilled. (Also see Air Stripping, Condensate, Evaporation, Steam Stripping, and Thermal Treatment.)

Divinyl

See 1,3-Butadiene.

Divinylene Oxide

See Furans.

DNA (deoxyribonucleic acid)

An essential component of all living matter and the basic chromosomal material transmitting the hereditary pattern.

Dodecachloropentacyclodecane

See Mirex.

Domestic Wastes

Wastes from individual residences. (Also see Solid Waste, and Waste.)

Dose

Measurement of the amount of a chemical received by a receptor, per unit of body weight, per unit of time. (Also see Criterion Dose.)

Dose-Response Evaluation

A component of risk assessment that describes the quantitative relationship between the amount of exposure to a substance and the extent of toxic injury or disease. In general, the frequency and/or severity of the effects is reduced as the level of exposure decreases. The dose-response relationship is the quantitative relationship between the amount of exposure to a substance and the extent of toxic injury produced. (Also see Dose.)

Dowfume 40

See ethylene dibromide.

Dowicide EC-7

See Pentachlorophenol.

Drinking Water Supply

Any raw or finished water source that is or may be used as a public water system or as drinking water by one or more individuals.

Drop Leaf

See Sodium Chlorate.

Drycleaners Naphtha

See Naphtha.

Dry Cleaning Fluid

See Perchloroethylene.

Dry Deposition

The settlement of very small particles and gases in the atmosphere onto available surfaces as the result of turbulence and molecular motion.

Dry Ice

See Carbon Dioxide.

Dump

A land site at which waste is disposed of in a manner which does not protect the environment, is susceptible to open burning, or is exposed to the elements, vermin and/or scavengers. (Also see Landfilling.)

Dursban

See Organophosphates.

Dust Suppression

Control of dust on unpaved temporary roadways through the application of a chemical suppressant, oil or water.

Dutch Oil

See Ethylene Dichloride.

E

EB

See Ethylbenzene.

Ecosystem

A community of organisms interacting with each other and their non-living surroundings.

Edaphic

Relating to the soil.

EDB

See Ethylene Dibromide.

EDC

See Ethylene Dichloride.

Effluent

Liquid waste material, treated or untreated, discharged from industrial or other sources.

Effluent Polishing

The final stage(s) of physical/chemical treatment designed to remove residual suspended solids, organic contaminants and/or inorganic contaminants from liquid effluent.

Elayl

See Ethylene.

Electroacoustical

Description: This soil decontamination process involves application of both direct current electric and acoustic fields to transport and remove floating contaminants. Ionized components and water, under the influence of an electric potential, travel to the electrodes (a process known as electroosmosis) where ion exchange, electrolysis, oxidation/reduction or other techniques may be used to remove them. The acoustic field enhances, in ways not fully understood, the dewatering and leaching of wastes.

Wastes Handled: May be used to remove lighter-than-water contaminants and, perhaps, heavy metals from fine grained clay soils.

Availability: The technology is in pilot scale testing.

Electrode

A conducting surface on which electrons enter or leave an electrolytic or galvanic cell. There are two electrodes per cell, an anode and a cathode.

Electrodialysis

Description: A membrane separation process in which an electric field induces dissolved components to migrate across semi-permeable membranes, separating salts and minerals from the aqueous stream. Filtered wastewater passes between alternating cation-permeable and anion-permeable membranes stacked in the membrane module. This results in the concentration or dilution of salts in alternating compartments. In reverse electrodialysis, the current is reversed three or four times an hour to keep the membranes clean, extend membrane life and minimize chemical use. The dilute treated effluent may be suitable for direct discharge; the concentrated effluent may be sent for recycling/recovery or further treatment.

Wastes Handled: Used to treat wastewaters containing moderately high concentrations of inorganic salts, removing acids and metal salts.

Availability: A proven technology, electrodialysis is in widespread use for the production of drinking water from brackish/ salt water sources. It is also employed in a number of industrial effluent treatment and demineralizing processes. (Also see Dialysis, Reverse Osmosis, and Ultrafiltration.)

Electrolysis

Description: In this oxidation/reduction reaction, a direct current is passed between

an insoluble anode and a cathode submerged into a metal-containing or other electrolytic solution. Positively charged metallic ions travel to the cathode where they are chemically reduced and deposited in their metallic form. The accumulated buildup is removed periodically from the cathode surface. Gases that require capture and treatment may be generated during electrolysis.
Wastes Handled: Used primarily to recover heavy metals from aqueous solution and the treatment of metal cyanide wastes (cyanides are destroyed by a combination of electro-oxidation and electro-chlorination). It is generally not used for removing dissolved organics, or organic waste streams of viscous and tarry liquids.
Availability: A number of commercial electrolytic systems, using a variety of cathode/anode materials and configurations, are on the market. (Also see Oxidation and Reduction.)

Electrolytic Oxidation

See Electrolysis.

Electrolytic Reduction

See Electrolysis.

Electro-Osmosis

See Electroacoustical.

Electrophoresis

Description: Electrophoresis involves the transport of electrically charged particles within a direct current electric field.
Wastes Handled: The process works on large complex molecules, colloidal or particulate matter (such as clay), living cells and bacteria, and emulsified material (such as droplets of emulsified oil) provided the suspended matter has a net charge.
Availability: Although the process has been used both in the laboratory and in some industrial applications, it is not yet commercially available as a waste treatment technology. (Also see Electroacoustical, and Electrolysis.)

Electrostatically Augmented Scrubber

A specialized form of wet scrubber that uses electrostatic particle charging to enhance its particulate collection ability. (Also see Electrostatic Precipitator.)

Electrostatic Precipitator (Dry)

An apparatus which removes particulates from flue gases by the use of electrical forces. (Also see Electrostatic Precipitator (ESP).)

Electrostatic Precipitator (ESP)

A device that removes particulates from flue gases by placing an electrical charge on them and attracting them onto a collecting electrode. When installed in incineration plants, they significantly reduce air emissions of particulates, alone or as part of an air pollution control system. The appartus may be employed in both wet and dry scrubbing systems.

Electrostatic Precipitator (Wet)

An electrostatic precipitator in which the inlet transition is equipped with continuous sprays and the collecting electrodes are continually flushed with a liquid film. In addition to particulate removal, absorption of gaseous contaminants from the flue gas by the scrubbing liquid is also accomplished for those contaminants that are water soluble. (Also see Electrostatic Precipitator (ESP), and Wet Scrubber.)

Emergency Exposure Limit (EEL)

Limit applied to unpredictable short-term exposures. If this limit is not exceeded, personnel emergency response should not be severely hindered. However, reversible, non-incapacitating effects may be experienced. (Also see Short-Term-Exposure-Limit (STEL), Short-Term-Public-Limit, and Threshold Limit Value (TLV).)

Emissions

Pollutants in the form of gases or fine particles released into the atmosphere, usually from a stack. May also mean any release of pollutants into the environment from industrial, residential, municipal, institutional, or commercial sources. (Also see Pollution.)

Empty Container

A container from which wastes or other materials have been removed using the removal practices commonly used for the specific materials (such as pumping or pouring) and that contains less than 2.5 cm of material on the bottom of the container. Such containers can still retain hazardous quantities of contaminants. (Also see Commercial Chemical Waste.)

Emulsion

Stable mixture of two or more immiscible liquids held in suspension by small amounts of substances known as emulsifiers.

Emulsion Breaking

Description: Emulsion breaking, the separation of oil from water emulsions, is often the first step in a wastewater cleanup or oil recovery process. Acidification (the most common technique), thermal swing, strong electric fields or centrifugation may be used for emulsion breaking. Settling takes place in a tank where the oil is skimmed from the surface. The recovered oil can be recycled or incinerated; the wastewater may require neutralization or other treatment.
Wastes Handled: Oily wastes may be treated by emulsion breaking.
Availability: Technology in wide use.

Emulsion Liquid Membrane Separation

Description: Emulsion globules (typically, oil droplets containing an acidic or basic aqueous reagent) are mixed into a waste stream. The oil acts as a membrane through which the contaminants diffuse and, in turn, react with the internal reagent. Purified wastewater is then separated from the globules through gravity, and the emulsion broken to retrieve the contaminant and recycle the membrane phase.
Wastes Handled: Current research is concentrating on the removal of phenols from wastewaters. However, a variety of membrane compounds, reagents, complexing agents and carriers can be tailored for the selective removal of a wide variety of low-concentration contaminants.
Availability: The process has been successfully tested at the laboratory scale.

Encapsulation

A waste physical treatment process which encases or encloses the waste with either adhesive coating materials or specially-lined containers such as steel lined drums or concrete blocks in order to isolate it and keep it from contaminating the environment. (Also see Solidification/Stabilization.)

Endosulfan

See Chlorinated Hydrocarbons.

Endothermic

A reaction that absorbs heat as it proceeds, but is not self-sustaining.

Energy Balance

Refers to the balance of energy inputs and outputs for a particular treatment process step or system.

Energy Recovery

Obtaining energy, typically, from the controlled incineration of industrial or municipal wastes.

Engineered Landfill

See Landfilling.

Engravers Acid

See Nitric Acid.

Ent 54

See Acrylonitrile.

Ent 1506

See DDT.

Ent 15,349

See Ethylene Dibromide.

Ent 25,719

See Mirex.

Entex

See Organophosphates.

Environment

Section 1(c) of the *Ontario Environmental Assessment Act* defines "environment" in very broad terms as: (i) air, land or water; (ii) plant and animal life, including man; (iii) the social, economic and cultural conditions that influence the life of man or a community; (iv) any building, structure, machine or other device or thing made by man; (v) any solid, liquid, gas, odour, heat, sound, vibration or radiation resulting directly or indirectly from the activities of man; or (vi) any part or combination of the foregoing and the interrelationships between any two or more of them in or of Ontario.

Environmental Assessment

A planning process by which the environmental effects of various alternative courses of action are identified and evaluated for the purpose of gaining approval for a proposed undertaking under the *Environmental Assessment Act*.

Environmentally Sensitive/ Significant Areas (ESAs)

Areas having beneficial qualities, natural assets or inherent biological sensitivity including terrestrial and aquatic habitats, areas with rare or endangered species, breeding grounds, wetlands, recharge zones, flood plains, etc. which may be of scientific or educational importance. This term has been designated by conservation authorities. (Also see Area of Important Biological Resources, Area of Natural and Scientific Interest, and Significant Environmental Unit.)

Environmental Persistence

The quality of a chemical being resistant to degradation, if at all, in the environment.

Environmental Protection Act (EPA)

The legislation that provides the basis for the control and regulation of environmental pollution of both air and water in Ontario.

Environmental Protection Agency (EPA)

The U.S. federal government agency responsible for environmental matters.

Enzyme Treatment

Description: Enzymes produced by bacterial cultures, yeast, fungi or plants are highly specific chemical catalysts that can be used to break down or otherwise detoxify synthetic organics. Enzyme treatments can be implemented as part of a biological treatment process or for the in-situ bioremediation of contaminated soils and groundwaters. The use of enzymes to destroy toxic organics outside of a living cell, eliminates the concerns associated with releasing new strains of living organisms into the environment and nurturing their development.

Wastes Handled: Bacterial strains are available for degrading oily sludges, cyanides, and wastes from petrochemical, food processing and textile plants. Cell-free enzymes have been used to break down pesticides, PCBs, dioxins, and wastes from the leather, wood and paper industries.

Availability: A number of promising bioengineering approaches have been developed in the laboratory for detoxifying hazardous wastes. These include isolating enzymes for treating specific wastes, developing mutant bacteria (that are specially adapted to survive in and utilize specific wastes), and developing multi-functional organisms (that may break down one chemical and at the same time produce enzymes to treat a second chemical). A number of dry enzyme powders and strains of adapted bacteria are commercially available (often in a freeze-dried condition, although there is some controversy concerning the effectiveness of these materials). (Also see Biological Treatment, Bioremediation, Composting, and Landfarming.)

EPA
(1) *Environmental Protection Act* (Ontario); or (2) U.S. Environmental Protection Agency.

Epidemiological Study
Study of human populations to identify causes of disease. Such studies often compare the health status of a group of persons who have been exposed to a suspect agent with that of a comparable non-exposed group.

1,2-Epoxyethane
See Ethylene Oxide.

Epoxypropane
See Propylene Oxide.

EPTAM
See Carbamates.

EPTC
See Carbamates.

EP Toxicity
A characteristic that indicates the likelihood that certain metals and other constituents could be leached by an acid leaching medium in significant concentrations (as determined by a specific Extraction Procedure).

Equalization
See Blending/Equalization.

Equalizing Basin
A holding basin in which variations in flow and waste composition are averaged. Such basins are used to provide a flow of a reasonably uniform nature to a treatment unit, sometimes called a balancing waste reservoir.

ERP
Emergency Response Plan. (See Contingency Plan.)

Estaprop
See Chorophenoxy Compounds.

Estar
See Coal Tar.

Ester
An organic compound corresponding in structure to a salt in inorganic chemistry. Esters are derived from acids by the exchange of the replaceable hydrogen of the latter for an organic radical (group).

Etching Acid
See Hydrofluoric Acid.

1,2-Ethanediol
See Ethylene Glycol.

Ethanoic Acid
See Acetic Acid.

Ethanoic Anhydride
See Acetic Anhydride.

Ethanol
See Ethyl Alcohol.

Ethene
See Ethylene.

Ethine
See Acetylene.

Ethyl Alcohol
Formula: C_2H_5OH
Synonyms: absolute ethanol, alcohol, alcool ethylique, cologne spirit, denatured alcohol,

ethanol, ethyl hydrate, ethyl hydroxide, grain alcohol, spirits
Description: clear, colourless liquid with a characteristic alcohol odour; soluble in water (mixes); flammable, flashback may occur along vapour trails; can react vigorously with oxidizing materials, violently with acetyl chloride, chromates, hydrogen peroxide, nitric acid, perchlorates, silver nitrate
Uses: most important organic solvent in use today, used for resins, fats, oils and hydrocarbons; also used in chemical processing and the manufacture of anti-freeze, beverages, fuels (and gasohol), dyes, detergents, cleaning preparations, pharmaceuticals, cosmetics, explosives, surface coatings, and a number of other products
Health Hazards: classed as a depressant drug, the ingestion of even moderate amounts lowers inhibitions and may cause dizziness, headache, nausea, loss of motor control, shallow respiration, unconsciousness, and even death; vapours may irritate eyes and mucous membranes; denatured grades contain certain noxious additives to discourage internal use

Ethylbenzene

Formula: $C_6H_5CH_2CH_3$
Synonyms: EB, ethylbenzol, phenylethane
Description: clear, colourless liquid with aromatic odour; almost insoluble in water (floats); flammable; can react with oxidizing substances
Uses: used in the production of styrene, synthetic rubber, and cellulose acetate; component in fuels and gasoline; also present in mixed xylenes
Health Hazards: may cause kidney, liver, chronic respiratory and skin diseases; contact may cause irritation, defatting of the skin and dermatitis; inhalation of vapour may cause irritation of mucous membranes, headache, dizziness, narcosis

Ethylbenzol

See Ethylbenzene.

Ethylene

Formula: C_2H_4
Synonyms: bicarburretted hydrogen, elayl, ethene, liquid ethylene, olefiant gas
Description: colourless gas (or liquid under pressure) with a sweet odour and taste; slightly soluble in water (it floats and boils); extremely flammable and dangerous explosion risk; may react vigorously with oxidizing materials and acids; violent reaction with chlorine, chlorine dioxide, nitrogen dioxide, ozone, carbon tetrachloride, aluminum chloride, bromotrichloromethane
Uses: used in the manufacture of polyethylene, ethylene oxide, ethylene dichloride, ethylbenzene, ethanol, ethyl chloride, and other chemicals
Health Hazards: simple asphixiant with relatively low toxicity; inhalation of high concentrations may cause headache, drowsiness, dizziness, nausea, vomiting, loss of consciousness; liquid forms can cause frostbite; vapours are irritating to the eyes, nose and throat

Ethylene Bromide

See Ethylene Dibromide.

Ethylene Dibromide

Formula: $BrCH_2CH_2Br$
Synonyms: bromofume, 1,2-dibromoethane, dibromure d'ethylene (Fr.), Dowfume 40, EDB, ent 15,349, ethylene bromide
Description: colourless liquid with a sweet, chloroform-like odour; slightly soluble in water (sinks); non-flammable, but emits toxic fumes of bromine and hydrogen bromine when heated to decomposition; may react with strong oxidizers, reacts violently with metal powders of aluminum, zinc, and magnesium
Uses: used as an insecticide and fumigant (for grains and fruit trees), scavenger for lead in leaded gasoline, general solvent, waterproofing preparations, and in organic chemical synthesis

Health Hazards: strong irritant to eyes, skin and mucous membranes; prolonged contact may cause redness, blistering, ulcers, and dermal sensitization; inhalation may cause severe respiratory injury, central nervous system depression, and vomiting; may affect liver and kidneys, implicated in worker sterility; experimental carcinogen and teratogen

Ethylene Dichloride

Formula: $CH_2Cl\text{-}CH_2Cl$
Synonyms: bichlorure d'ethylene, brocide, 1,2-dichloroethane, Dutch oil, EDC, glycol dichloride
Description: clear, colourless, oily liquid with chloroform-like odour and sweet taste; slightly soluble in water (sinks); highly volatile, flammable, and explosive, emitting poisonous gases (hydrogen chloride, carbon monoxide, carbon dioxide, and phosgene), flashback may occur along vapour trails; reacts violently with aluminum, ammonia, oxidizing materials and caustics
Uses: used in production of vinyl chloride, anti-knock gasolines, and processing adhesives and coatings; paint, varnish and finish removers; other uses include fumigants, metal degreasing, soaps and scouring compounds, wetting and penetrating agents, ore flotation
Health Hazards: strong irritant to eyes and skin; strong narcotic action causes headache, confusion, depression, nausea, rapid pulse, fatigue and coma; can cause loss of appetite, lung edema, liver, kidney and central nervous system damage; suspected carcinogen and mutagen

Ethylene Dihydrate

See Ethylene Glycol.

Ethylene Glycol

Formula: $C_2H_6O_2$
Synonyms: antifreeze, 1,2-dihydroxyethane, 1,2-ethanediol, ethylene dihydrate, glycol, glycol alcohol, monoethylene glycol
Description: clear, colourless, syrupy liquid, relatively non-volatile and odourless; soluble in water (sinks and mixes); combustible and emits toxic vapours upon heating; may react with strong oxidizers; can react violently with chlorosulfonic acid, oleum, sulphuric acid
Uses: used as a coolant, anti-freeze and deicing fluid; a solvent and extractant for various purposes; also used in asphalt emulsion paints, heat transfer agents, low pressure laminates, brake fluids, polyester fibres and films, cosmetics, printing inks, wood stains, adhesives, leather dyeing, textile processing, ballpoint pen inks, lacquers, and resins
Health Hazards: acute exposures are rare, but can be absorbed across skin, inhaled or ingested causing depression of central nervous system, intoxication, headache, respiratory or cardiac failure, and brain damage; chronic symptoms include anorexia, reduced urination, involuntary and rapid movement of the eyeball, and throat irritation

Ethylene Monchloride

See Vinyl Chloride.

Ethylene Oxide

Formula: C_2H_4O
Synonyms: anprolene, carboxide, dihydrooxirene, dimethylene oxide, 1,2-epoxyethane, EtO, oxirane
Description: colourless gas (shipped in liquid form) with a sweet, ether-like odour; soluble in water (floats and mixes); a serious fire and explosion hazard when exposed to heat or flame; may polymerize violently (with the generation of heat) on contact with chlorides of iron, tin and aluminum, oxides of iron and aluminum, and alkali metal hydroxides; can react with acids, bases, alcohols, ammonia, copper, magnesium perchlorate, and potassium
Uses: used as an intermediate in making plastics, fibres and films, surfactants, coolants, anti-freeze and other organic chemicals; also used as a fumigant for foodstuffs and textiles, an agricultural fungicide, and a

sterilant in medical facilities
Health Hazards: at high doses, it is an acute irritant, central nervous system depressant; inhalation may cause nose and throat irritation (exposure numbs the sense of smell), nausea, vomiting, abdominal pain, difficulty breathing, coughing, dizziness and unconsciousness; delayed effects may include headache, bronchitis, pulmonary edema and secondary lung infections; contact can cause frostbite, severe burns, skin sensitivity, allergic reactions and eye damage; chronic exposure may affect lungs, liver, kidneys, adrenal glands, testes, blood and nervous system; suspected carcinogen

Ethylene Tetrachloride

See Perchloroethylene.

Ethyl Hydrate

See Ethyl Alcohol.

Ethyl Hydroxide

See Ethyl Alcohol.

Ethylic Acid

See Acetic Acid.

Ethyne

See Acetylene.

EtO

See Ethylene Oxide.

Evaporation

Description: In this physical separation process, heat (usually supplied by condensing steam in a heat exchanger unit) is used to vaporize a liquid from a solution, sludge or slurry. Evaporators differ from distillation units in that only a single vapour (containing one or a mix of components) is separated from the waste stream; there is no attempt to separate the components of the vapour. The objective may be either to reclaim the volatile component or concentrate the aqueous stream, sludge or slurry. Conventional mechanical evaporators include multi-effect, vapour compression, or multi-flash systems. Some degree of vacuum is commonly used to reduce the boiling point.
Wastes Handled: Any waste stream comprising a volatile and a relatively non-volatile fraction can be separated, concentrated or "dried" in an evaporator unit. Because of their high energy requirements, evaporator units are not used to concentrate very dilute solutions.
Availability: Evaporation is a proven and established process with decades of operating experience. New developments include much smaller units, as well as systems powered by solar energy. (Also see Distillation and Thermal Treatment.)

Exhaust Gas

See Carbon Monoxide.

Exothermic Reaction

A reaction that releases heat as it proceeds, and is self-sustaining.

Exposure

To receive a dose via ingestion, inhalation, or dermal (skin) contact.

Exposure Assessment

A component of risk assessment that involves estimating the nature and size of population exposed to a substance and the magnitude and duration of its exposure. The assessment could concern past, current or anticipated exposures.

Extended Aeration

See Activated Sludge.

F

Fabric Filter

Fabric filters are designed for particulate removal and/or to react with acid gases. The filter medium can consist of a paper cartridge, cloth bag (the most common), or a rigid ceramic tube.

Facilities Development Process (FDP)

This is the OWMC's approach for determining an appropriate waste management system for Ontario's liquid industrial wastes and hazardous wastes, the evaluation and selection of appropriate technologies, and the identification of an appropriate site(s). The various steps are: (1) information gathering, (2) selection of candidate region and systems and generic technologies, (3) selecting candidate areas and candidate sites, (4a) select preferred site(s), (4b) select specific technologies and conceptual designs, (4c) undertake site specific studies design, and (5) public hearings.

Factitious Air

See Nitrogen Oxides.

Facultative Lagoon

See Aerated Lagoon.

Fannoform

See Formaldehyde.

Fault Tree Analysis

Process often used to evaluate and quantify the probability of the series of events which lead to an upset condition or accident. (Also see Hazard Analysis, and Hazard and Operability Studies (HAZOPS).)

Fenitrothion

See Organophosphates.

Fenol, or Fenolo

See Phenol.

Fenthion

See Organophosphates.

Ferriamicide

See Mirex.

Ferric Chloride

Formula: $FeCl_3$
Synonyms: chlorure ferrique (Fr.), flores martis, iron chloride, iron III chloride, iron peroxide, perchlorure de fer (Fr.)
Description: brown to black solid, or yellow-brown to reddish-black solution; odourless or slightly acidic odour; soluble (sinks and mixes), solid ferric chloride reacts with water producing heat and corrosive HCl fumes; not combustible; strong oxidizing agent, very corrosive to copper, iron and most metals; violent reaction with allyl chloride, and sodium and potassium metals
Uses: used in treatment of sewage and industrial wastes; etching agent for engraving, photography and printed circuit boards; disinfectant and water purification; pigment; used in chemical industry
Health Hazards: corrosive and irritating on contact with skin, eyes and upper respiratory tract; inhalation may cause coughing and difficulty breathing; prolonged contact may cause staining of skin and dermatitis (similar to that caused by weak acids)

Ferric Perchloride,

See Ferric Chloride.

Ferric Trichloride

See Ferric Chloride.

Fertilizer Acid

See Sulphuric Acid.

Filter Cake

The dewatered product of a filtration process.

Filtrate
The liquid which has passed through a filter.

Filtration
Description: This mechanical process is used to separate suspended solids from liquids. Gravity, positive or negative pressure, or centrifugal force can be used to drive wastewaters through a porous filter medium, with the solids retained on or within the filter. Commercially available systems include granular media filters (beds of sand, coke, coal or porous ceramic, which must be backwashed regularly), flexible media filters (cloth or fine mesh screens), fixed media filters (such as rotary drum filters, cartridge filters, micro-strainers, disc filters, belt filter presses, and plate and frame filter presses), microscreening units (which use a motor-driven rotating drum covered with a fine screen mesh; entrapped solids are removed periodically with pressurized water jets), and buoyant filter beads. Wastewaters may be pretreated using flocculation and sedimentation/precipitation prior to filtration
Wastes Handled: Sludges/slurries generated by industrial waste or sewage treatment systems may be amenable to filtration. Input streams containing 5-15% solids may be concentrated in filter cake to 15-50% solids. Mobile microfiltration units have been used to treat leachates and contaminated wastewaters with solids concentrations ranging from 10 to 300,000 ppm.
Availability: This is a well-established separation technique, used in industrial and wastewater treatment, sludge dewatering, metal and other solids recovery. Microscreening units have been used to replace secondary settling tanks in some biological treatment systems.

Final Cover
The cover material that is applied upon closure of a landfill.

Fingerprinting
Laboratory testing of the delivered wastes using parameters selected from the pre-shipment analysis, to verify that wastes received for treatment are the same as samples previously submitted.

Firemaster
See Polybrominated Biphenyls.

Firewater Pond
Collection basin or pond used to store water for fire-fighting.

Fixation
See Solidification/Stabilization

Fixed Media Filtration
See Filtration.

Flame Ionization Detection Method
An analytical process used first to oxidize organic carbon and, then, quantify the total amount of organic carbon present in a gas stream.

Flash Point
The temperature under standard test conditions at which the vapours released by heating a liquid ignite when exposed to an open flame.

Flexible Media Filtration
See Filtration.

Floc
A mass of aggregated suspended solids, whose production is promoted by flocculants, so that the solids will settle rapidly.

Flocculation
Description: Flocculation involves the coagulation of small suspended particles into larger ones that more readily settle out (through precipitation and sedimentation) or float to the surface (flotation) for subsequent removal. Flocculating agents (such as alum or polyelectrolytes) are often mixed into wastewater to promote the process.
Wastes Handled: Flocculation has been

used to aid the removal of a wide range of suspended solids including heavy metals, organic colloids, and various particulates which may have absorbed other contaminants.
Availability: Almost every industry that generates a liquid waste stream employs some form of flocculation and sedimentation/precipitation. A number of specialized flocculating agents are commercially available for treating industrial wastes. (Also see Flotation, Precipitation and Sedimentation.)

Flores Martis

See Ferric Chloride.

Flotation

Description: Suspended particles, colloidal or emulsified substances adhere to small air bubbles (which have been injected under pressure or through mechanical agitators) and float to the surface for removal by skimmers or other mechanical systems. Available configurations include dissolved air, vacuum, dispersed air, column, and electro-flotation. Coagulants are sometimes added to aid flocculation; the administration of specific reagents may also allow the selective removal of different components in succession.
Wastes Handled: Air flotation is often used for secondary treatment or polishing (following sedimentation or centrifuging) of a wastewater stream. It does not have the flexibility for dealing with a broad range of suspended solids and immiscible liquids.
Availability: In wide use, particularly in treating wastes containing oil or grease. Froth flotation cells have been developed for the cleaning of contaminated soils.

Flowers of Sulphur

See Sulphur.

Flue Gas

The gaseous products of combustion leaving the stack (flue). The term is commonly applied to combustion gases still in the system.

Fluidized Bed Biological Contactor (FBBC)

Description: A variation on the activated sludge process, the FBBC is a fixed film biological treatment system in which aerobic microbe colonies attach themselves to an inert material, such as sand. The sand is kept in circulation by the upward flow of wastewater through the reactor vessel. The major advantage of fluidized bed systems is the very high ratio of surface area (of the sand particles covered with microbe colonies) to volume which allows the FBBC to handle high organic loadings. Conditions (flow rate, oxygen levels, pH, temperature, heavy metal content, etc.) must be carefully controlled to ensure the system's optimum performance.
Wastes Handled: The technology is suitable for both industrial and domestic aqueous organic wastes.
Availability: FBBC systems are not in wide use. (Also see Activated Sludge, and Biological Treatment.)

Fluidized Bed Combustion

Description: Combustion air is introduced at the bottom of the vertical fluidized bed incinerator, passing through a distribution plate and a bed of heated granular material (usually silica sand, although limestone and other materials have been used). The bed material is circulated and rapidly mixed with the waste, allowing the unit to be operated at lower temperatures (600-900°C). Volatile gases are drawn into a secondary chamber for final oxidation (acid gases may be removed by basic compounds in the bed) and then cleaned. Inorganic materials may build up in the bed, requiring continuous bed removal and restoration.
Wastes Handled: The process is amenable to liquids, sludges and other wastes containing a high ash content. However, no bulk solids can be handled, nor can wastes containing large concentrations of chlorine or fluorine.
Availability: Fluidized beds are used primarily to dispose of sludges from petroleum

refineries, pulp and paper mills, and sewage treatment plants. A number of commercial systems, including a mobile unit, are available. (Also see Circulating Bed Combustion, Incineration and Thermal Treatment.)

Fluidized Bed Digesters

See Anaerobic Digestion.

Fluor

See Fluorine.

Fluorides

See Fluorine.

Fluorine

Formula: F_2
Synonyms: bifluoriden, fluor (Fr.), fluoro, fluorures acide (Fr.)
Description: a non-metallic element, pale yellow compressed gas with a sharp, choking odour; reacts with water to form hydrogen fluoride; though nonflammable, it reacts violently with a wide range of organic and inorganic compounds, and is a fire and explosion risk; fluoride refers to any compound containing fluorine (inorganic and many organic fluorides are quite poisonous, and often extremely corrosive)
Uses: the most powerful oxidizing agent known (forms fluorides with all the elements except helium, neon, argon); used in production of fluorides, chlorofluorocarbons; active constituent of fluoridating compounds used in drinking water, toothpaste, etc.; also used in uranium processing and rocket fuels
Health Hazards: a very powerful caustic irritating the nose, eyes, skin and respiratory tract, may cause severe burns, loss of vision; inhalation may cause coughing fits, bronchial spasms, pulmonary edema, and death; liver and kidney damage seen in animals

Fluorocarbon

See Chlorofluorocarbons.

Fluorochloromethane

See Chlorofluorocarbons.

Fluorohydric Acid

See Hydrofluoric Acid.

Fluorures Acide

See Fluorine.

Fluorwodor

See Hydrofluoric Acid.

Fluxing Lime

See Calcium Oxide/Hydroxide.

Fly Ash

Non-combustible particles carried by combustion flue gas. These can be removed by pollution control equipment. (Also see Bottom Ash.)

F:M Ratio

The ratio of food (nutrients) to population of micro-organisms.

Forcemain

A pipeline requiring pump pressure for liquid to flow. The term is normally used in connection with sewage discharge mains.

Formaldehyde

Formula: HCHO
Synonyms: aldehyde formique (Fr.), Formalin, formic aldehyde, formol, Karsan, methanal, methylene glycol, methylene oxide, oxomethane, oxomethylene
Description: clear, colourless liquid with a pungent, irritating odour; soluble in water (sinks and mixes); moderate fire risk; reacts violently with nitrogen dioxide, (perchloric acid and aniline), performic acid
Uses: used in the production of urea resins (for making plywood, particle board and foam insulation), phenolic resins, pentaerythritol, melamine, and a number of other chemicals; used as a disinfectant, germacide, embalming fluid and preservative; used in precious metal recovery
Health Hazards: a strong irritant, contact can cause severe burns and, over time, a tanning effect, dermatitis, and allergic

sensitization; vapours are very irritating to the eyes (causing itching and watering) and the respiratory tract (causing sore throat, coughing, allergic effects, gastric pain, bronchitis, and possibly death); a suspected carcinogen

Formalin
See Formaldehyde.

Formic Aldehyde
See Formaldehyde.

Formol
See Formaldehyde.

Formonitrile
See Hydrogen Cyanide.

Formyl Trichloride
See Chloroform.

Fosforobianco
See Phosphorus.

Fosgeen, Fosgen, or Fosgene
See Phosgene.

Four Rs (4Rs)
Reduction, reuse, recycling and recovery of waste. These are management practices that aim at minimizing the amount of waste which must be disposed of. (Also see Reduction, Reuse, Recycling, Recovery, and Three Rs (3Rs).)

Freeboard
The vertical distance between the top of a tank sidewall or top of a surface impoundment dike or berm, and the elevation of the highest surface of the waste contained in the tank or impoundment.

Free Liquids
Liquids which readily separate from the solid portion of a waste or other material under ambient temperature and pressure.

Freeze Crystallization
See Suspension Freezing.

Freeze Dewatering
See Suspension Freezing.

Freeze Drying
Description: Freeze drying could be used to concentrate wastes by removing, under vacuum conditions, the water vapour of a frozen material.
Availability: Although commonly employed in food preparation, freeze drying is not currently being used in waste treatment because of the high cost of the procedure and the long cycle time required. (Also see Suspension Freezing.)

Freon
See Chlorofluorocarbons.

Freon 20
See Chloroform.

Freon 30
See Methylene Chloride.

Friable
Easily crumbled.

Fugitive Emissions
Emissions released into the atmosphere from sources such as leaky valves, flange connections, open containers, etc. It is possible to minimize fugitive emissions by applying good design practices.

Furadan
See Carbamates.

Furans
Description: family of 135 compounds, including polychlorinated dibenzo-p-furans (PCDF). (Also see Dioxins.)
Uses: found as contaminates in PCBs and other complex chlorinated compounds; also formed during fires.

G

Garbage

Generally refers to wastes generated from households and non-industrial sources.

Gasoline

Synonyms: motor spirits, petrol
Description: a clear volatile liquid, with a characteristic odour; a mixture of hydrocarbons, including branched-chain paraffins (isooctane), cycloparaffins, and aromatic compounds; insoluble in water (floats); highly flammable, dangerous fire and explosion risk, can react vigorously with oxidizing materials
Uses: used as a fuel in internal combustion engines (forms include antiknock, cracked, high-octane, lead-free, natural, polymer, pyrolysis, reformed, straight-run, and white gasoline); also used as a diluent and solvent throughout industry
Health Hazards: irritating to the skin, eyes and mucous membranes, repeated exposure may defat the skin, and cause dermatitis or hypersensitivity; vapour acts as a central nervous system depressant resulting in staggering, slurred speech, flushed appearance, mental confusion, and in high doses, unconsciousness, coma, pneumonitis and death; may attack liver, kidneys, pancreas and spleen; absorption of lead additives may cause additional health problems

Gelber Phosphor

See Phosphorus.

Generator

The operator of a facility which produces liquid industrial wastes and/or hazardous wastes.

Generator Registration Database

A database compiled from waste generator records submitted to the Ontario Ministry of the Environment in accordance with Ontario Regulation 347.

Genetron

See Chlorofluorocarbons.

Geological Isolation

See Underground Storage.

Geomembrane

An essentially impermeable membrane used with foundation, soil, rock, earth or any other geotechnical engineering-related material as an integral part of man-made project, structure or system. (Also see Geotextiles, and Liner.)

Geotechnical

Refers to the application of scientific methods and engineering principles to the acquisition, interpretation and use of knowledge of materials of the earth's crust for the solution of engineering problems.

Geotextiles

Any permeable textile used with foundation, soil, rock, earth or any other geotechnical engineering-related material as an integral part of human-made project, structure or system. (Also see Geomembrane, and Liner.)

Gesarol

See DDT.

Glacial Acetic Acid

See Acetic Acid.

Glassification

A process in which solid residues from waste treatment are made into a matrix of molten glass which, when cooled and deposited in an engineered landfill, will minimize residue contact with the environment. (Also see Vitrification, and Molten Glass Incineration.)

Glucinum

See Berylium.

Glycol
See Ethylene Glycol.

Glycol Alcohol
See Ethylene Glycol.

Glycol Dichloride
See Ethylene Dichloride.

Gold Bronze
See Copper.

Grain Alcohol
See Ethyl Alcohol.

Granular Activated Carbon
See Carbon Adsorption.

Granular Media Filtration
See Filtration.

Granular Zinc
See Zinc.

Gravity Sedimentation
See Sedimentation/Precipitation.

Gravity Separation
Process in which liquids and/or solids of different densities in a mixture separate over time due to the force of gravity.

Gravity Thickening
Process by which the solids of a sludge settle and concentrate due to gravity.

Grease
In wastewater, a group of substances including fats, waxes, free fatty acids, calcium and magnesium soaps, and certain other nonfatty materials that are solid at ambient temperatures. The type of solvent and method used for extraction should be stated for quantification.

Ground Level Concentration
The concentration of a pollutant in the atmosphere at ground level. (Also see Maximum Point of Impingement.)

Groundwater
Water which exists in the internal passageways of porous geological formations and which flows in response to gravitational forces. Sometimes the source of water for communities and industries.

Groundwater Plume
A body of contaminated groundwater, originating from a specific source and influenced by such factors as the local groundwater flow pattern, density and concentration of contaminant, and character of the aquifer.

Grubbing
Removing vegetation at a site prior to construction.

Guardsman
See Pentachlorophenol.

Guesarol
See DDT.

Gum Spirits
See Turpentine.

Gumthus
See Turpentine.

Guthion
See Organophosphates.

H

Habitat

The sum total of environmental conditions of a specific place that is occupied by an organism, a population, or a community.

Halite

See Sodium Chloride.

Halogenated Organics

Refers to organic compounds containing fluorine, bromine, chlorine, iodine or astatine.

Halons

See Chlorofluorocarbons.

Hauled Liquid Industrial Waste

Liquid waste, as specified in Ontario Regulation 347, that is transported in tanks or other containers for treatment, disposal or recycling.

Haulers

In waste management, transporters which move waste from its point of generation to its off-site destination.

Hazard Analysis

The systematic identification of potential accidents and upset conditions of industrial facilities, and the quantitative analysis of their probability and consequence. (Also see Fault-Tree Analysis.)

Hazard and Operability Studies (HAZOPS)

A systematic method of identifying the potential accidents and upset conditions of industrial facilities.

Hazardous Industrial Waste

The generic or specific waste listed in Schedule 1 of Ontario Regulation 347 but does not include a waste that is listed in Schedule 1E of the above-mentioned regulation.

Hazardous Waste

Waste that poses potential danger to human beings or other organisms because it is toxic, ignitable, explosive, reactive, corrosive, radioactive, pathological or has some other property that produces substantial risks to health or life. Ontario Regulation 347 sets out the parameters for determining whether a particular waste is classified as hazardous, either through special diagnostic tests or by reference to exhaustive lists of generic commercial chemicals and particular waste streams. The term excludes radioisotope wastes, domestic wastes, ash from the incineration of domestic waste, sewage waste, agricultural waste, inert fill, and small quantities of hazardous wastes. (Also see Special Waste.)

Hazardous Waste Chemical

Means a commercial chemical waste having a generic name listed in Schedule 2, Part B of Ontario Regulation 347 unless a declaration is made pursuant to Section 5 that the waste is not "Hazardous Waste Chemical".

Hazardous Waste Landfill

An environmentally sound disposal facility on land where hazardous waste can be placed without polluting the environment, not including a land farming facility, a lagoon or surface impoundment, or a deep well injection facility. (Also see Landfilling (Secure Chemical).)

Hazardous Waste Management

The systematic control of the collection, source separation, storage, transportation, processing, treatment, and disposal of hazardous wastes. It also includes application of 4R or 3R techniques.

Hazardous Waste Site

A location where hazardous wastes are stored, treated, incinerated, or otherwise disposed.

Heavy Metals

A group of metals which include the following: aluminum, antimony, arsenic, cadmium, chromium, cobalt, copper, iron, lead, mercury, nickel, silver, tin, and zinc.

Heptachlor

See Chlorinated Hydrocarbons.

Herbitox

See Chorophenoxy Compounds.

Hexabromobiphenyl

See Polybrominated Biphenyls.

Hexachlorocyclopentadiene Dimer

See Mirex.

Hexahydrobenzene

See Cyclohexane.

Hexamethylene

See Cyclohexane.

Hexanaphthene

See Cyclohexane.

Hexavalent Chromium

See Chromium.

HF

See Hydrofluoric Acid.

Hg

See Mercury.

Hi-Flash

See Naphtha.

Higher Heating Value (HHV)

This is a measure of the total or gross heat energy that will be released during combustion of a substance. It is determined by measuring the amount of heat recovered when the products of complete combustion for a unit quantity of a substance are cooled to the initial temperature of the substance and the ambient air and the water produced is condensed. (Also see Lower Heating Value.)

High Gradient Magnetic Separation

Description: This is a physical separation process for removing magnetic and weaker paramagnetic particles from liquids and slurries. A high intensity magnetic field traps metal particles in a filter matrix (such as steel wool or woven steel fabric). The field is turned off periodically to allow the entrapped particles to be washed from the filter and recovered for re-use. Non-magnetic contaminants may be captured if a flocculant is used to bind them to magnetic particles seeded into the waste.
Wastes Handled: The process can handle high flow rates of wastewaters containing magnetic particles.
Availability: Magnetic separation is currently used in ore preparation and other industrial processes. It has potential application in waste treatment.

High or Substantial Impact

Refers to impacts that are expected to exceed government laws, regulations, guidelines or policies. Where no such standards exist, high impact refers to a level that would not be considered to be within the normal day-to-day experiences of people or natural features. These levels are expected to cause concern and be outside of normal engineering and planning practices. (Also see Low or Minimal Impact, and Medium or Moderate Impact.)

High Temperature Slagging Incinerator (HTSI)

Description: HTSI is a volume reduction technique that thermally transforms waste into a mechanically strong, chemically stable basalt-like material (in granular or bulk form).

Wastes that have been shredded and mixed are fed into a combustion chamber operating at 1,400°C. Inside the chamber, wastes in an upper layer of molten slag are oxidized, while contaminants in a lower layer undergo pyrolysis. The slag droplets are drawn off, quenched and burst into granules. Off-gases are completely oxidized in a post-combustion chamber (at 900°C) and then passed through a series of purification units.

Wastes Handled: Originally designed for treating low-level radioactive wastes, the technology may be applied to almost any waste stream. Because of its high cost, HTSI may be limited to high hazard wastes, such as PCBs, pesticides and asbestos compounds.

Availability: HTSI systems are being offered commercially; full-scale units have been used to treat radioactive wastes for more than ten years. Other waste treatment applications are still being tested. (Also see Incineration, and Thermal Treatment.)

High-to-Low-Dose Extrapolation

The process of determining low exposure risks from the measured high exposure and high risk data.

High Vapour Pressure Organics

Organics that steadily volatize under ambient conditions, such as gasoline, paint thinner, mineral spirits, etc.

Household Hazardous Waste

Hazardous waste from households (e.g., leftover paints, antifreeze, oils, pesticides, etc.).

Huile d'Aniline

See Aniline.

Human Health Risk

The likelihood (or probability) that a given exposure or series of exposures may have damaged or will damage the health of individuals experiencing the exposures.

Hydragyrum

See Mercury.

Hydration

The reaction of water with a substance in which the bonds in the water molecule are not split. The strong affinity of water molecules for particles in solution is the fundamental cause of electrolytic dissociation.

Hydraulic Conductivity

Ratio of flow velocity to driving force for viscous flow under saturated conditions of a specified liquid in a porous medium. The magnitude of hydraulic conductivity is described by hydrogeologists in units such as cm/sec or m/sec. Familiar conversions of these figures would be: 10^{-6} m/sec is about 1 cm in three hours; 10^{-7} m/sec, about 1 cm per day; 10^{-8} m/sec, 1 cm in twelve days; 10^{-9} m/sec, 1 cm in 116 days; 10^{-10} m/sec, 1 cm in 3.2 years.

Hydraulic Jet Mixing

Description: The extremely turbulent conditions created by the hydraulic jets effectively mixes any solid, liquid or gaseous reactants or reagents used (for example, in oxidation or pH adjustment) during a waste treatment process. Sufficient volumes of air are also injected into the waste to strip dissolved gases and volatile organic compounds.

Wastes Handled: Jet mixing could be usefully employed for the addition of reagents to any liquid waste or slurry.

Availability: The hydraulic mixing system was developed for the treatment of acid mine waters and is currently being applied to other waste treatment problems. (Also see Blending/Equalization.)

Hydrochloric Acid

Formula: HCl

Synonyms: acide chlorhydrique (Fr.), chlorohydric acid, hydrochloride, hydrogen chloride, muriatic acid, spirits of salt

Description: colourless or slightly yellow,

fuming liquid with a pungent odour; a strong and highly corrosive acid; soluble in water (sinks and mixes); noncombustible, but dangerous hydrogen chloride gas is released on heating; reacts with metals (forming flammable hydrogen gas), reacts violently with a number of compounds
Uses: used for boiler scale removal; as a chemical intermediary in the production of fertilizers, dyes, etc.; also used in ore reduction, food processing (and as a food additive), pickling and metal cleaning, general cleaning and industrial acidizing, electroplating, tanning, and the petroleum, photographic, textile and rubber industries
Health Hazards: vapours cause severe irritation of the upper respiratory tract, laryngitis, coughing, burning and choking, and pulmonary edema; severe burns and scarring of skin and blinding/loss of vision on contact; repeated exposure may cause dermatitis and dental discolouration

Hydrochloride
See Hydrochloric Acid.

Hydrocyanic Acid
See Hydrogen Cyanide.

Hydrofluoric Acid
Formula: HF (in solution)
Synonyms: acide fluorhydrique (Fr.), AHF, etching acid, fluorohydric acid, fluorwodor, HF, hydrogen fluoride
Description: a colourless liquid (hydrofluoric acid) or gas (hydrogen fluoride) with a pungent, suffocating smell; acid is very soluble in water (sinks and mixes), while HF dissolves, floats and boils, evolving heat and HF vapours; not combustible; reacts violently with large number of compounds
Uses: the acid is used in the production of aluminum fluoride, fluorocarbons, and gasoline; acid also used in pickling stainless steel, etching glass, acidizing oil wells; HF is an important component in many chemical processes; used in working, polishing or cleaning stone and brick, enamels, crystal, metal castings, galvanized iron, silks, and cast iron, copper and brass
Health Hazards: highly corrosive to the skin and mucous membranes, may cause severe (slow to heal) skin burns, gangrene, and irreversible eye damage; absorption of even a small amount may be fatal, although symptoms may be delayed 1-8 hours; inhalation may cause pain in throat, difficulty breathing, headache, fatigue, shock, coma, and death

Hydrogen Chloride
See Hydrochloric Acid.

Hydrogen Cyanide
Formula: HCN
Synonyms: acide cyanhydrique (Fr.), cyclon, cyclone B, formonitrile, hydrocyanic acid, prussic acid. (Also see Cyanides.)
Description: colourless gas or water-white liquid with the slight odour of bitter almonds; soluble in water; highly flammable and explosive; may polymerize spontaneously and explosively if not pure or stabilized
Uses: used as a fumigant, and in electroplating and chemical synthesis; may also be generated in blast furnaces, gas works, and coke ovens
Health Hazards: intensely poisonous, this asphyxiant may cause death very quickly (by disrupting the transfer of oxygen to the tissues of the body) following inhalation, ingestion or absorption across the skin; lower levels may irritate the eyes and upper respiratory tract, and cause weakness, headache, confusion, nausea and vomiting

Hydrogen Dioxide
See Hydrogen Peroxide.

Hydrogene Sulphure
See Hydrogen Sulphide.

Hydrogen Fluoride
See Hydrofluoric Acid.

Hydrogen Nitrate

See Nitric Acid.

Hydrogen Peroxide

Formula: H_2O_2
Synonyms: albone, hydrogen dioxide, inhibine, perhydrol, peroxan, peroxide, peroxyde d'hydrogene (Fr.)
Description: clear, colourless liquid with a slightly sharp odour and bitter taste; soluble in water; not combustible, but can cause the ignition of combustible materials on contact or when heat is applied; may decompose with explosive violence on contact with iron, copper, chromium, brass, bronze, lead, silver, manganese (and their salts); reacts violently with long list of compounds
Uses: used in bleaching and deodorizing (of textiles, wood pulp, hair, fur, bones, flour, fruit, glue, gelatin, silk, soap, straw, wax, etc.); also used in the pulp and paper industry, food processing, dyeing, chemical processing and the manufacture of a number of chemical compounds (including antiseptics, plasticizers, foam rubber, and rocket fuels), and as a substitute for chlorine in water and sewage treatment,
Health Hazards: contact irritates the skin, eyes and mucous membranes, may cause delayed burns and blisters at higher concentrations; inhalation of vapour causes irritation of the respiratory system, with effects ranging from sore throat to mild bronchitis to pulmonary edema

Hydrogen Selenide

See Selenium.

Hydrogen Sulphate

See Sulphuric Acid.

Hydrogen Sulphide

Formula: H_2S
Synonyms: acide sulphhydrique (Fr.), hydrogene sulphure (Fr.), stink gas, sulphureted hydrogen, sulphur hydride
Description: a colourless gas (or liquid under pressure) with an offensive, rotten-egg odour; soluble in water (liquid floats, boils and dissolves); highly flammable, emitting toxic sulphur oxides, flashback can occur along vapour trails; can react vigorously with oxidizing materials, violently with a number of compounds
Uses: used in the purification of hydrochloric acid and sulphuric acid, in precipitating sulphides of metal, in the manufacture of heavy water and a number of other compounds (including nylon, soda ash, elemental sulphur, mercaptans, etc.), and as an analytical reagent
Health Hazards: poisonous if inhaled, causing irritation of the nose, throat and eyes, sneezing, headache, dizziness, nausea, vomiting, cold sweats, weakness, unconsciousness and death; contact may cause irritation and painful inflammation; loss of ability to smell gas lost with high doses or over extended exposures

Hydrogeology

The study of groundwater with particular emphasis given to its chemistry, mode of migration, and relation to the geologic environment.

Hydrology

Science of the properties of water.

Hydrolysis

Description: A chemical transformation involving double decomposition reactions with water. Reactions are usually carried out at elevated temperatures and pressures, often aided by acid, alkali or enzyme catalysts
Wastes Handled: Both organic and inorganic wastes can be hydrolyzed. Feed streams include aqueous and non-aqueous wastes, slurries, sludges, tars and pesticides.
Availability: In wide-spread use in industrial processing.

Hydrophilic

"Water-loving"; refers to molecules that associate with water; readily wet by water.

Hydrophobic
"Water-hating"; refers to molecules or groups of molecules that are poorly soluble in water; water repellent or not wet by water.

Hydroxybenzene
See Phenol.

Hydroxyde de Potassium
See Potassium Hydroxide.

Hydroxyde de Sodium
See Sodium Hydroxide.

Hygroscopic
Tending to absorb moisture.

Hypochlorite
See Sodium Hypochlorite.

Hyvol
See Polychlorinated Biphenyls.

I

Ignitable Waste
Refers to a liquid waste with a flash point less than 61° Celsius, solid waste that is capable of causing fires through friction, absorption of moisture or spontaneous chemical changes, and which, when ignited, burns so vigorously and persistently that it creates a danger; an ignitable compressed gas; an oxidizing substance.

Imidan
See Organophosphates.

Immiscible
Refers to substances (of the same phase or state of matter) that cannot be uniformly mixed or blended.

Immobilization
The treatment of waste to prevent constituents of the waste from leaching or otherwise moving into the environment.

Immobilize
To render constituents of waste less mobile, usually through stabilization or solidification.

Impermeability
As applied to soil or sub-soil, the degree to which fluids, particularly water, cannot penetrate in measurable quantities.

Incineration
Description: The controlled burning of organic wastes. All incinerators consist of a burner, an air/oxygen supply and charge system, waste feeder, combustion chamber(s), monitoring equipment, and appropriate air cleaning equipment. High heat is used to transform waste materials into gases, inert

ashes and whatever compounds are entrained in the air pollution control system. The degree of combustion depends on operating temperature, retention time, fuel type and waste heating value, available oxygen, mixing in the combustion chamber, and the size of the unit.

Wastes Handled: Organic liquids, slurries, sludges and solids can be incinerated.

Availability: The incineration of liquid industrial and hazardous wastes is less than 30 years-old, with many technical advances coming in the last 15 years. Commercially available systems include circulating bed combustors, fluidized bed combustors, liquid injection incinerators, multiple hearth incinerators, rocking kiln incinerators, and rotary kiln incinerators. (Also see Advanced Oxygen Combustion, At-Sea Incineration, Calcination, High-Temperature Slagging Incineration, Infra-Red Incineration, Molten Glass Incineration, Molten Salt Incineration, and Thermal Treatment.)

Incineration Waste

The residue from incineration, other than incinerator ash and fly ash.

Incinerator Ash

The ash residue, other than fly ash, resulting from incineration where the waste is reduced to ashes containing by weight less than 10% of combustible materials.(Also see Fly Ash.)

Incinerator Residue

The residue from incineration, including slag, ashes and fly ash recovered from pollution control devices.

Incompatible Waste

(a) A waste that is unsuitable for placement within a specific portion of a landfill because it may cause containment material to corrode/decay, or when combined with other wastes might produce heat, pressure, fire, explosion, violent reaction, toxic dust, mists, fumes, or gases.

(b) wastes which, if mixed, would become more hazardous than either waste individually.

Indirect Gas/Air Heat Exchange

A process for cooling gas emissions by heat transfer from the emissions to the cooler air without direct physical contact between the two.

Inerteen

See Polychlorinated Biphenyls.

Inert Fill

Earth or rock fill that contains no putrescible materials or soluble or decomposable chemical substances.

Infectious Waste

Waste that contains pathogens. Consist of tissues, organs, body parts, blood, and body fluids that are removed during surgery. (Also see Biological Hazardous Waste, Pathogenic Waste, and Pathological Waste.)

Infiltration

The flow of a fluid into a substance through pores or small openings. The word is commonly used to denote the flow of water into soil material.

Influent

That which flows in.

Infra-Red Incineration

Description: This thermal system uses electrically-powered silicon carbon rods to bring organic wastes to combustion temperatures. As the waste moves along a wire mesh conveyor (residence time ranges from 5-50 minutes), it is exposed to infra-red radiant heat up to 880°C. Scrubber effluent is used to quench the ash before it is collected in a hopper. Any remaining combustibles are driven off and incinerated in a gas-fired afterburner (at temperatures up to 1,200°C)

before being passed to a conventional emission control system.
Wastes Handled: Suitable for organic wastes contained in soils or sediments.
Availability: A mobile unit has undergone full-scale testing and is currently being marketed commercially. (Also see Incineration, and Thermal Treatment.)

Ingestion

Type of exposure whereby materials enter the body through the mouth by consumption of solids or liquids.

Inhalation

Type of exposure whereby materials enter the body by being taken into the lungs.

Inhibine

See Hydrogen Peroxide.

Injection Grouting

Description: Suspensions (such as quick lime, clay, cement, chemical polymers or bituminous grouts) are injected under pressure into contaminated soils to impede the movement of contaminants. Techniques include curtain grouting, jet grouting, area grouting, contact grouting and large void sealing.
Wastes Handled: Injection grouting is used to reduce leaching from landfill sites, detoxify wastes or fix contaminants.
Availability: The process is under development. (Also see Bioremediation, In-Situ Chemical Treatment, and Solidification/Stabilization.)

Inner Liner

A continuous layer or lining of material placed inside a tank or other container which protects the construction materials (e.g., carbon steel) of the tank or container from the contents. (Also see Liner.)

Inorganic

Not containing carbon. (Also see Organic.)

Inorganic Waste

Waste predominantly composed of non-carbon inorganic materials such as acids, alkalis, metals, etc.

In-Situ Biological Treatment

See Bioremediation

In-Situ Chemical Treatment

Description: This treatment allows contaminants in soil or groundwater to be detoxified, stabilized or broken down in place without the need for excavation. A wide range of chemicals in dry, slurry, liquid, or vapour form (including precipitating, neutralizing and oxidizing/reducing agents, solvents, acids and bases, and solidificants) may be injected into the site through various drilling and deep-soil mixing technologies. Bioremediation and the air or steam stripping of volatiles may be carried out concurrently.
Wastes Handled: Contaminants that can be treated in-situ include metals, petroleum hydrocarbons, chlorinated hydrocarbons, PCBs and radionuclides.
Availability: A number of commercial systems for delivering chemical treatment agents are available. In-situ chemical treatment of contaminated soils is the subject of extensive research in the U.S. and Canada. (Also see Bioremediation, Injection Grouting, Physical/Chemical Treatment, and Solidification/Stabilization.)

In-Situ Vitrification

See Vitrification.

Integrated Facility

A facility with all of its components located and interconnected at a single site.

Interspecies Extrapolation

Extrapolation of the data from one species to another species for which data are unavailable. An interspecies extrapolation model is used to extrapolate from results observed in laboratory animals to humans.

Iode, or Iodio

See Iodine.

Iodine

Formula: I_2
Synonyms: iode (Fr.), iodine crystals, iodio, jod, jood
Description: non-metallic element, iodine is a violet or grayish-black, heavy solid with a metallic lustre and a sharp characteristic odour; insoluble in water; noncombustible, but emits highly toxic iodine fumes when heated; can react vigorously with reducing materials, incompatible with ammonia, acetylene, acetaldehyde, powdered aluminum, and active metals
Uses: used in dyes, chemical processing, antiseptics and germacides, medical treatment, pharmaceuticals and medicinal soaps, stabilizers, photographic film, and water treatment
Health Hazards: effects similar to those of bromine and chlorine, but dangerous levels rarely encountered (due to low volatility); contact may cause irritation of the nose and eyes, skin burns and hypersensitivity; inhalation may cause headache, coughing and tight feeling in chest; strong poison if swallowed

Ion

An atom or a radical that has lost or gained one or more electrons and has thus acquired an electrical charge.

Ion Exchange

Description: A chemical separation process, ion exchange involves the exchange of ions (often metallic inorganics) between an aqueous wastewater solution and a solid ion exchange material. Wastewater (which has been pretreated to remove suspended solids) is passed through columns or beds of the ion exchange media, resulting in the removal of toxic inorganics from solution and their attachment to the ion exchange resins. This continues until the resins are saturated and the exchange is completed. A regenerant solution (such as a concentrated brine or acid) is then used to remove the entrained material and restore the original ionic species to the exchange resin. The ion exchanger is then backwashed to remove excess regenerant and is ready for re-use.
Wastes Handled: Ion exchange is used to remove heavy metals, toxic anions and cations from dilute waste streams. Resins are structurally stable, and able to tolerate a wide range of temperature and pH conditions. Suspended solids should be controlled to prevent plugging.
Availability: A well-proven and versatile technology, both natural ion exchange materials and highly specific synthetic ion exchangers are commercially available. (Also see Resin Adsorption.)

Ionization

A chemical change by which ions are formed from a neutral molecule.

Ionizing Wet Scrubber (IWS)

A wet scrubber is a device for the removal, or washing out, of entrained liquid droplets or dust, or for the removal of an undesired gas component from process gas streams. An ionizing wet scrubber combines the established principles of electrostatic particle charging, image force attraction, inertial impaction and gas absorption to collect submicron solid particles, liquid particles, and noxious and malodorous gases simultaneously. (Also see Electrostatic Precipitator, and Scrubbing.)

Iosol

See Naphtha.

IPA

See Isopropyl Alcohol.

IPC

See Carbamates.

Iron Chloride,
See Ferric Chloride.

Iron Chromite
See Chromium.

Iron Peroxide
See Ferric Chloride.

Irradiation Processes
A number of pollution control processes in the developmental stage which are designed for simultaneous removal of nitrogen oxides (NO_x) and sulphur dioxide (SO_2) from combustion flue gases by irradiating flue gases either with an electron beam or ultraviolet radiation.

Isocyanates
See Methyl Isocyanate.

Isocyanatomethane
See Methyl Isocyanate.

Isocyanic Acid Methyl Ester
See Methyl Isocyanate.

Isofenphos
See Organophosphates.

Isohol
See Isopropyl Alcohol.

Isomer
One or more molecules having the same number and types of atoms and hence the same molecular weight, but differing in respect to the arrangement or configuration of the atoms.

Isopar
See Naphtha.

Isopropanol
See Isopropyl Alcohol.

Isopropyl Alcohol
Formula: $CH_3CHOHCH_3$
Synonyms: alcool isopropylique (Fr.), dimethyl carbinol, IPA, isohol, petrohol
Description: colourless liquid with a pleasant, alcohol-like odour; soluble in water (floats and mixes); dangerous fire and explosion risk, flashback may occur along vapour trail; can react vigorously with oxidizing materials, violently with oleum, phosgene, and potassium-t-butoxide
Uses: used in the manufacture of acetone, glycerol, and many dyes and pesticides, and an ingredient in lotions, soaps, liniments, cosmetics, hair tonics and preparations, antifreezes and window cleaners; also used as a solvent (for oils, gums, resins, coatings, cellulose derivatives, etc.), and a preservative
Health Hazards: relatively non-toxic; contact may cause mild irritation of the eyes and skin, higher levels may result in defatting and cracking of the skin and severe eye irritation; inhalation causes depression of the central nervous system; isopropyl alcohol produced using the old "strong-acid" process may have been carcinogenic, process changes appear to have removed that threat

Isotope
One of two or more atoms of the same chemical element having the same number of protons and electrons, but differing in the number of neutrons. The isotopes of an element have slightly different mass.

IWS
See Ionizing Wet Scrubber.

J

Javel Water
See Sodium Hypochlorite.

Jet Grouting
See Injection Grouting.

Jod, or Jood
See Iodine.

Joule (J)
The SI unit used to express all forms of energy and work. One British thermal unit (Btu) equals 1055 Joules. (Also see Btu.)

K

Kanechlor
See Polychlorinated Biphenyls.

Karsan
See Formaldehyde.

Kelthane
See Chlorinated Hydrocarbons.

Kepone
See Chlorinated Hydrocarbons.

Ketone Propane
See Acetone.

Ketones
Description: a class of organic compounds in which a carbonyl group (C-O) is attached to two other organic groups; includes acetone, acetophenone, cyclohexanone, diethyl ketone, methyl ethyl ketone (MEK), and Michler's ketone; colourless liquids with a sweet odour; slightly soluble in water; dangerous fire and explosive risk
Uses: used as solvents (especially for cellulose derivatives) but also for plastics, lacquers, paints, explosives, and textile processing; intermediaries in chemical processing
Health Hazards: may be inhaled or absorbed through the skin; some ketones are highly volatile and may have a narcotic or anaesthetic effect; most ketones do not cause chronic problems, although Michler's ketone, used in making dyes, is an experimental carcinogen

Kettle Bottoms
Residues accumulated in distillation pots and reactors, sometimes referred to as kettles. (Also see Still Bottoms.)

"Knock Out" Chamber

A chamber employed to remove particulate material from gases in motion, such as incinerator flue gases.

Ksylen

See Xylene.

Kwik

See Mercury.

L

Lacquer Diluent

See Naphtha.

Lagoon

See Aerated Lagoon, Waste Stabilization Pond.

Land Burial

The disposal of wastes into land (landfills, surface impoundments, permanent waste piles, and underground injection wells). This method is used for hazardous substances that require permanent storage. The most common procedure, near surface burial, deposits materials directly into the ground or in stainless-steel tanks or concrete-lined pits in the earth.

Landfarming

See Land Treatment.

Landfilling (Municipal)

Description: The same general engineering principles of siting, operation, leachate collection and closure that apply to secure chemical landfills also apply to municipal landfills. However, municipal wastes are not usually pretreated prior to disposal and containment systems may not be as elaborate.
Wastes Handled: Domestic and non-hazardous, solid industrial wastes may be disposed of in municipal landfills. A small number of municipal landfills are still licensed to accept certain, non-hazardous liquid industrial wastes.
Availability: Landfilling of non-hazardous solid wastes is widely practiced. However, the difficulty in siting new municipal landfills, environmental concerns and the rising cost of operation are placing increased impetus on waste minimization, re-use and recycling

efforts. In addition, the landfilling of some readily recyclable solid wastes (such as cardboard) may be restricted. (Also see Disposal, Dump, Hazardous Waste Landfill, and Landfilling (Secure Chemical).)

Landfilling (Secure Chemical)

Description: The secure chemical landfill provides for the long-term isolation of waste residues from the environment. This is achieved by, first, limiting which waste residues are acceptable for landfilling, and subsequently controlling all emissions to groundwater, surface water or air. In a conventional secure chemical landfill, solidified wastes are placed in excavated cells or trenches; in an above-ground landfill, the cells are constructed entirely above ground level, eventually forming a mound. In either configuration, a secure chemical landfill should be: sited in an appropriate geologic and hydrogeologic setting; isolated from ground, surface and stormwater contact; secured against public access/exposure; equipped with primary and, perhaps, secondary liner systems (both flexible membrane and clay liners are used), monitoring wells and equipment, and run-off and leachate collection systems; and designed for post-closure maintenance, monitoring, and the collection and treatment of leachate and landfill gases. Daily operation involves strict protocols for laboratory analysis, record keeping, pretreatment, placement, covering, and capping of all wastes accepted. Although landfilling is usually considered a means of final disposal, some waste components may be recovered in the future (as long as adequate records are kept and there are economic reasons to do so).

Wastes Handled: The hazardous industrial wastes acceptable for landfilling are strictly defined under provincial regulation and the operating Certificates of Approval for each facility. In general, wastes should be dewatered and otherwise reduced in volume, detoxified to the extent possible, and stabilized, solidified or encapsulated prior to landfilling. Liquid wastes are usually excluded.

Availability: The engineered secure chemical landfill is a well-developed technology and is used extensively in Canada for the disposal of solid and semi-solid sludges. Both commercial facilities and private on-site chemical landfills are in operation. (Also see Above-Ground Storage, Disposal, Dump, Hazardous Waste Landfill, Landfilling (Municipal), Solidification/Stabilization, and Underground Storage.

Land Spreading

See Land Treatment.

Land Treatment

Description: Land treatment (also known as landfarming, sludge farming, or land spreading) is one of the simplest biological treatment methods available, and relies on the natural assimilative capacity of the soil. It involves spraying, injecting or plowing liquid wastes/sludges into the upper 15-20 centimeters of the soil. The wastes are then adsorbed on soil particles, volatilized, biodegraded by naturally occurring micro-organisms, or otherwise transformed physically, chemically or biologically. Oxygen levels, moisture content, nutrients (particularly nitrogen and phosphorus) and pH conditions may be manipulated to increase the efficiency of the process. Soil characteristics also determine the success of land treatment; the soil must be sufficiently fine to hold moisture and retain contaminants. Monitoring must be carried out to ensure that the soil's assimilative capacity is not exceeded. Because of the threat of water contamination, an efficient run-on/run-off control system is critical. Odours may also be a problem.

Wastes Handled: Organic wastes amenable to biodegradation, such as some petrochemical wastes, sewage sludges and food processing wastes, may be landfarmed. The rate of waste application must be controlled to limit the accumulation of toxic inorganics or refractory organics in the soil. Some pretreatment may be necessary to detoxify wastes. Consult provincial guidelines for more information on suitable wastes.

Availability: The technology is well developed, relying on many of the soil preparation techniques and systems commonly used in agriculture. The application of sewage sludge to agricultural land is a common practise in Ontario; landfarming is also widely used by oil refiners. (Also see Biological Treatment, Composting, and Enzyme Treatment.)

Land Treatment Facility

A facility or part of a facility at which waste is applied or incorporated into the soil surface; such facilities are disposal facilities if the waste will remain after closure.

Lannate

See Carbamates.

Laughing Gas

See Nitrogen Oxides.

Lavatar

See Coal Tar.

LC_{50}

The lethal concentration of a substance in air that, when administered by means of inhalation over a specified length of time in an animal assay (test), is expected to cause the death of 50% of a defined population.

LD_{50}

The single lethal dose of a substance that, when administered by a defined route in an animal assay (test), is expected to cause the death of 50% of a defined animal population.

Leach

To dissolve out by the action of a percolating liquid.

Leachate

The liquid which escapes from a landfill as the result of water percolating through and picking up certain soluble waste fractions en route. The percolating water is the leachate and the ability of the landfill material to leach is called its leachability.

Leachate Toxic Waste

Waste that produces leachate containing any of the contaminants in Schedule 4 of Ontario Regulation 347 at concentrations in excess of one hundred times as specified in the Schedule using the Leachate Extraction Procedure or an equivalent approved testing procedure.

Leach Test

A test protocol to measure the leachability of the landfill material, treated or untreated. (Also see EP Toxicity.)

Lead

Formula: Pb

Synonyms: lead flake, olow; also see Tetraethyl Lead

Description: a pale silvery or blue-gray metal which darkens on exposure to air; soft, malleable and resistant to corrosion; dust is a moderate fire and explosion hazard when exposed to heat or flame, many compounds emit dangerous lead fumes when heated; may be used in its pure form or combined to form a variety of organic and inorganic compounds

Uses: metallic lead is used in storage batteries, solders, ammunition, chemical production, piping and corrosion-resistant liners for tanks, and radiation shielding systems; organic compounds used in high pressure lubricants and lead soaps, and as gasoline antiknock agents; inorganic salts used in insecticides, pigments and paints, glazes, glass, plastics and rubber compounds

Health Hazards: lead dusts, fumes, lead-containing mists, liquids, and volatile organic compounds are more toxic, and may be inhaled, ingested or (in the case of organic liquids) absorbed across the skin; a cumulative poison, lead can affect the blood, kidneys, gastrointestinal tract, brain, nervous system, and reproductive system, and cause behavioural changes, and vision and hearing impairment; acute effects include a metallic taste in the mouth, vomiting and cramps, disturbed sleep, headache, and psychosis (the last three symptomatic of organic lead poisoning), brain damage, convulsion, coma and death; chronic effects include headache, fatigue, irritability, pain in the joints and muscles, stomache cramps and constipation; severe cumulative poisoning may cause a blue line on the gums, wrist droop, paleness and severe abdominal pains; experimental teratogen

Lean Organic

A material with a low organic content, usually less than 4,000 kilojoules per kilogram. (Also see Rich Organic.)

L/G

Liquid-to-Gas ratio.

Lifetime Exposure

Total amount of exposure to a substance that a human would receive in a lifetime (assumed to be seventy years in OWMC's current risk assessment).

Lift Thickness

As used by OWMC, it is the depth of a layer of solidified material deposited in the landfill on each pass across the active face.

Light Mineral Spirits

See Naphtha.

Light Naphtha

See Naphtha.

Light Non-Aqueous Phase Liquids

Liquids which are essentially insoluble in water (and less dense than water).

Light Spirits

See Naphtha.

Lime Water

See Calcium Oxide/Hydroxide.

Lindane

See Chlorinated Hydrocarbons.

Linde Oxygen Combustion System

See Advanced Oxygen Combustion

Liner

As used by OWMC in landfill design, a relatively thin layer of natural clay or manufactured material which serves as a barrier to minimize the rate of leaching from landfills, lagoons, and ponds etc. (Also see Geomembrane, Geotextiles, Inner Liner, and Synthetic Liner.)

Liquefied Natural Gas

See Natural Gas.

Liquid Bleach

See Sodium Hypochlorite.

Liquid Entrainment

The presence of minute drops of water or other liquids in the vapour produced by evaporation or distillation.

Liquid Ethylene

See Ethylene.

Liquid Industrial Waste

Liquid waste as specified in Ontario Regulation 347. (Also see Hazardous Waste, and Special Waste.)

Liquid Injection Incineration

Description: The distinguishing feature of this thermal treatment process is the waste atomization device (or nozzle) which breaks the waste into a fine spray and directs it into a specific location in the primary combustion chamber (some systems are equipped with afterburners). Off-gases are directed to

emission control equipment. Temperatures range between 800-1,000°C, with residence times of 1-3 seconds. These systems contain no moving parts and require the least maintenance of all incinerator types. Various configurations, including horizontal, vertical and sloped, are available.
Wastes Handled: Pumpable organic wastes can be handled; solids must first be dissolved or melted into a liquid waste stream. Because these units are sensitive to changes in waste composition and flow rate, storage and mixing facilities are necessary to guarantee a steady and homogeneous flow.
Availability: This is a widely used, proven technology. (Also see Incineration, and Thermal Treatment.)

Liquid-Liquid Extraction

Description: This process, also known as solvent extraction, is used to remove specific constituents from aqueous solutions through their selected absorption into a second, immiscible liquid. The constituents must be more soluble in the extracting solvent than in the original solution (various reagents can be used to enhance the extraction process). The solvent is then sent for cleaning/re-use and the recovery of the absorbed components. Configurations include simple gravity columns, mechanically agitated columns, mixer/settlers, centrifugal collectors, and the counter-current multistage extractor.
Wastes Handled: Used for the recovery of phenols and related compounds from refinery and coke oven wastes, for reclaiming metals and cyanides from plating wastes, and for stripping chlorinated hydrocarbons (including PCBs) from transformer fluids. Solvent extraction is being increasingly used to recover valuable components from dilute wastewaters.
Availability: A well established unit operation in the chemical industry, liquid-liquid extraction is now being used widely in wastewater treatment. Common solvents include toluene, benzene and kerosene, as well as a number of proprietary formulations. New techniques are being developed for cleaning contaminated soils and sludges using solvent extraction. Removal of residual solvents from the "cleaned" material remains a problem. (Also see Low Energy Extraction.)

Liquid Pitch Oil

See Creosote.

Litmus Paper

Indicator paper used for chemical analysis. It turns blue in alkalis (bases) and red in acids.

LNG

See Natural Gas.

Long-Term Care

As used in waste management, the post-closure monitoring and maintenance of a waste management facility in a manner that protects public health and the environment.

Low Energy Extraction

Description: This is a solvent extraction process used to remove selected contaminants from soils. After dewatering, a contaminant-specific solvent (or extractant) is mixed with the solid residuals in a multi-stage, paddle wheel extractor. Following gravity separation, the solvent stream with its contaminant load can be recycled (using liquid-liquid extraction) or incinerated.
Wastes Handled: The system was designed to remove low levels of organics, such as PCBs, from soils.
Availability: Pilot stage testing is currently underway.

Lower Heating Value (LHV)

A measure of the net (useful) amount of energy released during combustion of a unit quantity of a substance. It is equal to the higher heating value (HHV) less the latent heat of the moisture contained in the products of combustion. (Also see Higher Heating Value.)

Lowest-Observed-Adverse-Effect Level (LOAEL)

Lowest level at which adverse effects are noted in the exposed population.

Lowest-Observed-Effect-Level (LOEL)

Lowest level at which effects are noted in the exposed population.

Low or Minimal Impact

Refers to impact which falls within the range defined by regulatory agencies as acceptable or insignificant (i.e. the probability that an individual will get cancer as a result of exposure is one-in-ten thousand or better). Where no such standards exist, low impact refers to a level that is considered to be within the normal day-to-day experiences of people or natural features. These levels are not expected to be of concern based on consideration of normal engineering and planning practices. (Also see High or Substantial Impact, and Medium or Moderate Impact.)

LPG

See Propane.

Lugger Truck

A truck specifically designed to handle removable containers for carrying various types of materials including wastes.

LUST

A commonly used acronym for Leaking Underground Storage Tank.

Lye

See Sodium Hydroxide.

Lysimeter

An instrument for measuring the water percolating through soils and determining the materials dissolved by the water.

M

Maintenance

All action taken to retain material in a serviceable condition. It includes inspection, testing, servicing, classification as to serviceability, repair, rebuilding, and reclamation. The routine, recurring work required to keep a facility in such condition that it may be continuously utilized in its original or designed capacity and efficiency.

Malathion

See Organophosphates.

Maneb

See Carbamates.

Mangan

See Manganese.

Manganese and its Compounds

Formula: Mn
Synonyms: colloidal manganese, mangan
Description: a reddish-grey or silvery, soft metallic element; decomposes in water to produce flammable hydrogen; moderate fire hazard in dust or powder form; can react with oxidizing materials, reacts violently with aluminum, chlorine, fluorine, hydrogen peroxide, nitrogen dioxide, phosphorus, and sulphur dioxide
Uses: most manganese is used in the iron and steel industry, in steel alloys (other alloys may be formed with copper, zinc and aluminum); also used in the manufacture of dry cell batteries, paints, varnishes, inks, dyes, matches and fireworks, fertilizers, and as a disinfectant, bleaching agent, colouring agent (in ceramics), and in chemical processing
Health Hazards: dust and fumes are only minor irritants; manganese may build up in

the liver, spleen, brain and spinal cord; although there is great variability in individual susceptibility, the symptoms of chronic poisoning include apathy, anorexia, headache, weakness, uncontrollable drowsiness, irritability and spasms; advanced symptoms may include unaccountable laughter, euphoria, impulsive acts, confusion, aggressiveness, hallucinations, speech irregularities and incoherence, tremors, loss of balance, and in the end, permanent disability indistinguishable from Parkinson's disease

Manifest Database

An Ontario Ministry of the Environment system set out in Ontario Regulation 347 to monitor the quantity, composition, origin, routing and destination of hazardous waste during its transportation from the point of generation to the point of disposal. The document used to record the required data is called a manifest or waybill. (Also see Waybill System.)

Margin-of-Safety (MOS)

Maximum amount of exposure producing no measurable effect in animals (or studied humans) divided by the actual amount of human exposure in a population.

Marlate

See Chlorinated Hydrocarbons.

Matacil

See Carbamates.

Material Balance

Refers to the balance of material inputs and outputs for a particular treatment process step or system. Frequently combined with energy as a material and energy balance.

Maximum Acceptable Concentrations (MACs)

Standards set by the Ontario Ministry of the Environment for acceptable levels of contaminants in drinking water in the province.

Maximum Point of Impingement

The point at ground level some distance away from an emission source where the contaminant levels are highest or predicted to be highest.

MCPA

See Chorophenoxy Compounds.

MCPB

See Chorophenoxy Compounds.

MDI

See Methyl Isocyanate.

Mechanical Multi-Cyclone

If incorporated in an air pollution control system, it is a particulate removal device similar in concept to the mechanical cyclone except the flue gas is introduced into a number of smaller cyclones called collecting tubes.

Mecoprop

See Chorophenoxy Compounds.

Medium or Moderate Impact

Refers to impacts that may meet or exceed any government law, regulation, guideline or policy. Moderate impacts may also be below these standards but be at a level that is not clearly within normal day-to-day experiences of people or natural features. Moderate impacts are not clearly within the range of normal engineering and planning practices. (Also see High or Substantial Impact, and Low or Minimal Impact.)

MEK

See Ketones.

Mercure, or Mercurio

See Mercury.

Mercury and its Compounds

Formula: Hg

Synonyms: hydragyrum, kwik, mercure, mercurio, quick silver, rtec

Description: a silvery-white, heavy metal with no odour; insoluble in water (sinks); both organic and inorganic compounds are in use; not combustible, mercury compounds readily vapourize in heat to release very toxic fumes; react violently with many materials, including acetylene, ammonia, chlorine, chlorine dioxide, methyl azide, and sodium carbide
Uses: used in extractive metallurgy, various amalgams or alloys used in dentistry, the manufacture of explosive caps and detonators, the production of polyurethane foams, and in tanning, printing and photography; also used in electric switches, arc lamps and mercury vapour lamps, batteries, some paints and pigments, and control instruments (such as switches, thermometers and barometers); formerly used in chlorine and caustic production, and in some pesticides and biocides
Health Hazards: both organic and inorganic mercury compounds are highly toxic due to their ability to build up in the brain, kidney and livers; skin problems and allergic reactions common; exposure may result in a metallic taste in the mouth, headache, shortness of breath, fatigue, chest and abdominal pain, vomiting, and diarrhea; chronic problems vary among individuals, and include emotional problems, loss of concentration, depression, fatigue, headache, loss of memory and reasoning powers, insomnia or drowsiness, tremors, loss of appetite, loss of coordination, problems with sense of taste or smell, tingling in the skin, nosebleeds, gum disease, and constriction in the field of vision

Methamidophos

See Organophosphates.

Methanal

See Formaldehyde.

Methanecarboxylic Acid

See Acetic Acid.

Methane Dichloride

See Methylene Chloride.

Methane Gas

Odourless, colourless, flammable gaseous hydrocarbon (CH_4) commonly called marsh gas. Methane is the main component of natural gas. (See Natural Gas.)

Methane Trichloride

See Chloroform.

Methanol

Formula: CH_3OH
Synonyms: carbinol, methyl alcohol, methyl hydroxide, wood alcohol or spirit
Description: clear, colourless, highly mobile liquid; repulsive odour when crude, slight alcohol odour when pure; flammable, highly volatile; soluble; reacts vigorously with oxidizers and a number of other compounds
Uses: 290 kilotonnes per year used in the production of formaldehyde, acetic acid, methanol-blended fuels, windshield de-icers, methylaminies, pipeline dehydrating agents, propellants, and solvents (for dyes, resins, rosins, shellac, cellulose, etc.)
Health Hazards: distinct narcotic effects, dizziness, nausea, headache, coma, cardiac depression, death; optic nerve damage leading to blurred vision, photophobia, blindness; slight irritant to mucous membranes; mild dermatitis; absorbed through skin; cumulative poison

Methenyl Trichloride

See Chloroform.

Methidathion

See Organophosphates.

Methomyl

See Carbamates.

Methoxone

See Chorophenoxy Compounds.

Methoxychlor

See Chlorinated Hydrocarbons.

Methyl Alcohol
See Methanol.

Methylbenzene
See Toluene.

Methylene Chloride
Formula: CH_2Cl_2
Synonyms: chlorure de methylene (Fr.), dichloromethane, Freon 30, methane dichloride
Description: colourless, very volatile liquid with a penetrating, ether-like odour; slightly soluble in water (sinks); nonflammable, but emits toxic fumes of hydrogen and chloride when heated to decomposition; may react with aluminum, magnesium and their alloys; reacts violently with lithium, sodium/potassium in alloys, and potassium-t-butoxide
Uses: used as a paint remover, degreasing solvent, blowing agent in foams, and aerosol propellant; also used in plastics processing, and low-temperature solvent extraction
Health Hazards: a human carcinogen and a narcotic; inhalation may cause irritation of the respiratory tract, headache, dizziness, giddiness, stupor, numbing and tingling in the limbs, nausea and unconsciousness; readily absorbed across the skin (with similar symptoms); contact may cause slight burns, and dry, scaly dermatitis; may be very damaging to eyes

Methylene Glycol
See Formaldehyde.

Methylene Oxide
See Formaldehyde.

Methylethene
See Propylene.

Methylethylene
See Propylene.

Methylethylene Oxide
See Propylene Oxide.

Methyl Ethyl Ketone
See Ketones.

Methyl Hydroxide
See Methanol.

Methyl Isocyanate
Formula: CH_3NCO
Synonyms: isocyanates, isocyanatomethane, isocyanic acid methyl ester, MIC
Description: a colourless liquid with a sharp pungent odour; soluble (reacts violently with water); highly flammable, evaporates easily, and will degrade to emit toxic nitrogen oxides, hydrogen cyanide and carbon monoxide upon heating; highly reactive, incompatible with water, alkalis, acids, amines, iron, tin, copper and their salts and other catalysts; closely related to 2,4-toluene diisocyanate (TDI) and diphenylmethane diisocyanate (MDI)
Uses: used in the production of polyurethane foams and plastics, and carbamate pesticides; MDI and TDI also used in the production of flexible and rigid foams, coatings, adhesives, and rejection-injection molding applications
Health Hazards: highly toxic when inhaled, MIC was the poison released during the 1984 accident in Bhopal, India; low exposures irritate eyes, nose and throat; higher levels may cause coughing, secretions, chest pain, shortness of breath, asthma, and in extreme case, edema and death; survivors may suffer from lung fibrosis and other respiratory problems; chronic exposure may cause sensitization and allergic, asthma-like attacks; may cause irreversible eye damage; exposure of pregnant women may cause brain damage in fetuses (particularly in the later stages of pregnancy)

Methyl Oxirane
See Propylene Oxide.

1-Methyl-2-(3-pyridyl)pyrrolidine
See Nicotine.

Methyltheobromine
See Caffeine.

Mevinphos
See Organophosphates.

MIC
See Methyl Isocyanate.

Microbe
A microscopic or ultramicroscopic organism (e.g., bacterium or virus).

Microbial Treatment
See Biodegradation/Bioremediation.

Microfiltration
A waste treatment technology which uses a membrane filter system to remove solids and/or bacteria (0.05 — 1.0+ microns in size) from a Liquid Waste. (Also see Filtration.)

Micron
A unit of measure equal to one millionth of a metre, and one thousandth of a millimetre.

Microscreening
See Filtration.

Micro-Strainers
See Filtration.

Midden
In archaeology, a garbage dump or place where refuse was purposefully deposited.

Miedz
See Copper.

Mineral Aggregates
Sand and gravel.

Mineral Naphtha
See Benzene.

Mineral Spirits
See Naphtha.

Mirex
Synonyms: Dechlorane, dodecachloropentacyclodecane, ENT 25,719, ferriamicide, hexachlorocyclopentadiene
Description: very white, odourless crystals; insoluble in water; persistent chlorinated hydrocarbon which is toxic to non-target organisms
Uses: used as an insecticide (particularly to control fire ants); use has been discontinued
Health Hazards: will bioaccumulate; experimental carcinogen

MISA
See Municipal-Industrial Strategy for Abatement

Miscible
Refers to liquids and/or gases which will mix uniformly or dissolve in one another.

Mitigation
Refers to measures taken in the construction or operation of a facility to reduce adverse impacts or risks or to enhance benefits.

Mixed Liquor Volatile Suspended Solids
A term commonly used in sewage treatment for the suspended solids of a mixed liquor which are combustible at 550° C.

Mn
See Manganese.

MOE
The acronym for the Ontario Ministry of the Environment.

Moisture Content
The quantity of water in a mass of soil, sewage, sludge or screenings; expressed in percentage by weight of water in the mass.

Molten Glass Incineration

Description: Combustible and non-combustible wastes are spread onto a pool of molten glass in an electric furnace. Immersed electrodes maintain the pool temperature above 1,260°C. The waste is burned to ashes or dried to solids and immediately melted into the glass. Off-gases undergo complete combustion in the second half of the combustion chamber and are passed to an emission control scrubber and other cleaning units. The excess glass, with its load of encapsulated residues, is drained periodically and packaged for disposal.
Wastes Handled: The system can handle a wide variety of dangerous or hard to dispose of liquids, solids and sludges.
Availability: Commercial units in several sizes are on the market. (Also see Molten Salt Incineration, and Thermal Treatment.)

Molten Salt Incineration

Description: Waste materials and combustion air are introduced below the surface of a molten salt bath (usually a mix of sodium and sodium sulfates) which reaches a temperature of 750-1,000°C. Hydrocarbons and air react within the bath (which acts as a catalyst to allow almost complete combustion at relatively low temperatures, as well as removing certain combustion byproducts, acidic compounds and other objectionable contaminants) to form carbon dioxide and water vapour. Hot gases pass through the bath to a secondary reaction zone and then on to an off-gas cleaning system. The bath must be circulated and cleaned regularly to remove the accumulated ash and solid combustion products. Different salts can be used, depending on the makeup of the anticipated waste stream.
Wastes Handled: Molten salt incinerators are designed to handle a wide range of extremely hazardous or persistent solids, liquids, sludges and gaseous wastes.
Availability: Still in the development stage, with a pilot-scale facility in operation. (Also see Molten Glass Incineration, and Thermal Treatment.)

Monitor

See Organophosphates.

Monitoring

The ongoing surveillance of a facility or site by measurements or observations of the operation or of the ambient air, groundwater, surface water, and soil conditions. (Also see Biomonitoring.)

Monochloroethylene

See Vinyl Chloride.

Monoethylene Glycol

See Ethylene Glycol.

Monohydroxybenzene

See Phenol.

Monomer

A very small molecule, such as vinyl chloride, that can combine with identical molecules to form a polymer.

Monsanto Penta

See Pentachlorophenol.

Morpholine

Formula: C_4H_8ONH
Synonyms: diethyleneimide oxide, diethylene oximide, oxa-4-azacyclohexane, p-isoxamzine, tetrahydro oxazine
Description: colourless, oily liquid with a fishy, ammonia-like odour; soluble in water (mixes); flammable, emitting highly toxic nitrogen oxides when heated to decomposition, flashback may occur along vapour trails; may react with oxidizing materials
Uses: used as neutralizing amine for water treatment, a corrosion inhibitor, an intermediate in rubber chemicals, and in the production of industrial floor polishes, waxes, washing powders, and pharmaceuticals

Health Hazards: inhalation may irritate the respiratory tract, and cause coughing, nausea, headache, and difficulty breathing (effects similar to those following ammonia exposure); contact may cause skin and eye irritations, burns and possible fogging of vision; readily absorbed by skin; liver and kidney damage reported in animal studies

Motor Benzol

See Benzene.

Motor Spirits

See Gasoline.

MSDS

Material Safety Data Sheet.

Multiple Hearth Incineration

Description: A multiple hearth incinerator consists of a refractory-lined circular steel shell containing a number of rotating hearths, stacked one above the other. Wastes are fed through a feed port in the furnace top onto the surface of the upper hearth. Rabble arms and teeth spiral the wastes across the face of the hearth and through drop holes so that they fall down to the hotter hearths below. In the upper hearths, the waste is dried and volatile gases driven off. Combustion takes place in the middle reaches where temperatures reach 900-1,000°C. The ash ultimately falls to the furnace floor. Air emissions are directed to air pollution control equipment. Slag particulates and residues from the air cleaning system are usually landfilled.

Wastes Handled: The technology may be used to treat some sludges, tars and granulated solid wastes. Liquid and gaseous wastes can sometimes be employed as an auxiliary fuel (which are injected through a side ports). Temperatures are not generally high enough to destroy hazardous wastes (especially chlorinated organics).

Availability: Multiple hearth incinerators have been in use since the 1930s to incinerate sewage sludges and similar industrial wastes (including still bottoms, refinery sludges, etc.). (Also see incineration, and thermal treatment.)

Multivalent Hydrous Oxides

A species which has both binary oxygen and molecule(s) of water bound to it.

Municipal-Industrial Strategy for Abatement (MISA)

A White Paper introduced in 1986 by the Ontario Ministry of the Environment aimed at the virtual elimination of toxic contaminants in municipal and industrial discharges into waterways.

Municipal Landfill

See Landfilling (Municipal).

Municipal Waste

Garbage, refuse and other waste materials including solid, liquid, semi-solid, or contained gaseous material resulting from operation of residential, municipal, commercial, or institutional establishments and from community activities.

Muriatic Acid

See Hydrochloric Acid.

Mutagenic

A material deemed capable of causing genetic mutations among offspring of human or animal populations exposed to it, whether by ingestion, inhalation, or skin contact.

N

Nabam

See Carbamates

Naphtha

Synonyms: aromatic solvent, circosol, cleaning solvents, CycloSol, drycleaners naphtha, Hi-Flash, iosol, isopar, lacquer diluent, light naphtha, mineral spirits, naphtha distillate or solvent, naphthyethylene, petroleum ether or naphtha, rubber solvent, safety solvent, Shell sol, Sol B, varsol, white spirits. (Also see Coal Tar.)
Description: a family of colourless to yellow, watery liquids with a gasoline-like odour; naphtha is a generic term applied to refined, partially refined, or unrefined petroleum products and liquid products of natural gas, which distil between the temperatures of 35° and 205°C; they are insoluble in water (float), very flammable, and incompatible with strong oxidizers
Uses: naphthas can be divided into eight classes: (1) petroleum ether, (2) rubber solvent, (3) light spirits, (4) varnish makers and painters naphtha, (5) coal tar naphtha, (6) light mineral spirits, (7) Stoddard solvent, and (8) odourless mineral spirits; naphtha is used as a solvent (for paints and surface coatings, inks, adhesives, drycleaning, rubbers and plastics, oils and greases, etc.); as a feedstock in the petrochemical industry, and in the production of automotive fuels
Health Hazards: inhalation may cause irritation of the respiratory tract, headache, vomiting, intoxication, fatigue, first pallor then a purplish discolouration of the skin, depression of the central nervous system, possible hemorrhaging of vital organs, coma and death; contact may cause irritation of skin and eyes, dermatitis, blistering, and drying and cracking of skin; petroleum naphthas are generally less toxic than those derived from coal tars

Naphtha Distillate or Solvent

See Naphtha.

Naphthyethylene

See Naphtha.

Narcylene

See Acetylene.

Natural Gas

Synonyms: liquefied natural gas, LNG, SNG, syn gas, synthetic natural gas
Description: colourless gas or liquid with almost no odour (methyl mercaptan is added to household fuel gas to impart a warning odour); a mixture of low molecular weight hydrocarbons (85% methane, 10% ethane, with the remainder a mix of propane, butane and nitrogen) obtained from oil fields, or synthesized from coal, naphtha, solid wastes, oil shale, manure, etc.; dangerous fire and explosion risk, incomplete combustion can produce toxic carbon monoxide
Uses: used as a fuel and cooking gas; a feedstock in the chemical industry (used to produce acetylene, ammonia, carbon black, ethyl alcohol, hydrocarbon fuels, nitric acid, vinyl chloride, and many others);
Health Hazards: a simple asphyxiant displacing oxygen and causing shortness of breath, unconsciousness and death; contact with liquid forms can cause frostbite

Neocid

See DDT.

Neurotoxicity

Adverse nervous system effects resulting from exposure to a substance via inhalation, ingestion or absorption through the skin.

Neutralization

Description: Neutralization, or pH control, involves adding acids or bases (often waste materials themselves) to a waste stream to create neutral salt solutions. This normally takes place in stirred mixing tanks, and is often a precursor to biological treatment, oxidation/reduction and many other treatment processes (the efficiency of some treatments is maximized at pHs other than 7, the neutral point). Neutralization or pH adjustment may cause the precipitation of certain metals, the dissolution of some solids, or the generation of gaseous emissions.

Wastes Handled: Neutralization is often used to treat liquid wastes, sludges or slurries with a pH outside the range 6-8. Waste streams containing sulfides and cyanides should not be neutralized unless the system is equipped to capture and treat gaseous emissions. Both organic and inorganic wastes may be subject to pH adjustment.

Availability: This is a very common industrial and waste treatment process.

Ni

See Nickel.

Nichel

See Nickel.

Nickel

Formula: Ni

Synonyms: nichel, Raney alloy

Description: hard, ductile, silvery-white metal; insoluble in water; flammable and toxic as a dust or fume; incompatible with acids, oxidizing agents, and sulphur; may react violently with titanium, ammonium nitrate, potassium perchlorate, and hydrazoic acid

Uses: used in many alloys (including low-alloy steels, stainless steel, copper and brass, permanent magnets, electrical resistance alloys); also used in electroplating and protective coatings, alkaline storage batteries, fuel cell electrodes, coloured ceramics and glass, magnetic tapes, nickel soaps in crankcase oils, and as a catalyst

Health Hazards: many nickel compounds are human or experimental carcinogens, which (following an average latency period of 25 years) may cause cancers of the lungs or nasal passages; most common effect of exposure is "nickel itch" eczema; there is great variation in individual sensitivity; animal studies have shown damaging effects on heart muscle, brain, liver and kidneys

Nicotine

Formula: $C_5H_4NC_4H_7NCH_3$

Synonyms: 1-methyl-2-(3-pyridyl) pyrrolidine

Description: an alkaloid found in tobacco; in its pure form, nicotine is a colourless, almost odourless oil, which turns brown on exposure to air; combustible, releasing nitrogen oxides, carbon monoxide and other highly toxic fumes when heated to decomposition; can react with other oxidizing materials, strong acids

Uses: component of tobacco; also used as an insecticide, in some drugs, and in tanning

Health Hazards: highly toxic, the symptoms of nicotine intoxication include nausea, vomiting, diarrhea, mental disturbances, twitching and convulsions; experimental carcinogen, mutagen, teratogen

NIMBY

Not In My Back Yard.

Nitration Benzene

See Benzene.

Nitric Acid

Formula: HNO_3

Synonyms: acide nitrique (Fr.), aqua fortis, azotic acid, engravers acid, hydrogen nitrate, nitrous fumes, red fuming nitric acid (RFNA), white fuming nitric acid (WFNA)

Description: colourless to light yellow or brown, watery liquid with a strong, choking odour; soluble in water (sinks and mixes); not combustible, but may ignite combustible materials on contact; a strong oxidizing agent, nitric acid will attack almost all metals, and reacts violently with long list of compounds,

including strong bases
Uses: used in the production of ammonium nitrate fertilizers, high explosives, nylon, lead pigments and metal nitrates, dyes, drugs, etc.; also used in uranium extraction, photo-engraving, and etching steel
Health Hazards: inhalation irritates the mucous membranes and may cause difficulty breathing, coughing fits, nausea, weakness, and at high levels, edema; chronic obstructive lung disease linked to prolonged exposure; contact may cause skin irritation (yellow discolouration, burns and ulcers) and eye damage, including blindness

Nitrification

A biological process in which organisms (such as Nitrosomonas and Nitrobacter) derive energy for growth from the oxidation of inorganic nitrogen compounds and result in nitrate compounds being produced. (Also see Denitrification.)

Nitrile Acrylique

See Acrylonitrile.

Nitrogen Blanketing

Introduction of nitrogen under pressure into a vessel or system to keep the oxygen level low in order to lower the risk of fire.

Nitrogen Dioxide

See Nitrogen Oxides.

Nitrogen Monoxide

See Nitrogen Oxides.

Nitrogen Oxide

See Nitrogen Oxides.

Nitrogen Oxides

Formula: NO_x
Synonyms: includes NO (nitrogen monoxide, oxyde nitrique), N_2O (nitrogen oxide, nitrous oxide, laughing gas, factitious air), NO_2 (nitrogen dioxide, azote, bioxyde d'azote), N_2O_3 (nitrogen trioxide), and N_2O_4 (dinitrogen tetroxide)
Description: family of generally odourless and colourless gases, or liquids (NO_2 is a red-brown gas with an irritating odour); somewhat soluble in water (reacting to form nitric and nitrous acids and generating heat; generally noncombustible, although some compounds may vigorously support combustion, and dangerous when heated to decomposition (emitting highly toxic NO_x fumes); can react vigorously with reducing materials, violently with a long list of compounds
Uses: NO used in chemical production, and bleaching rayon; N_2O used as an anesthetic, a propellant in food aerosols, and in leak detection; NO_2 used in chemical production (as an oxidizing agent, catalyst, etc.); N_2O_3 used in chemical processing and as an oxidant in special fuel systems; NO_x fumes are a common air pollutant, generated by the breakdown or combustion of many chemical compounds
Health Hazards: deadly poison; inhalation causes irritation of the lungs, congestion of the throat and bronchi, edema, fall in blood pressure, headache, and dizziness (dangerous amounts can be inhaled before discomfort is felt); higher concentrations may cause coughing, burning in the chest and throat, and 6-24 hours later, tightness in the chest, difficulty breathing, restlessness, loss of consciousness, and death; survivors may develop pneumonia; chronic exposure to low levels may cause irritation of the respiratory tract, cough, headache, loss of appetite, corrosion of teeth, gradual loss of strength, persistent low blood pressure, and in extreme cases, neurological and brain damage (amnesia, tremors, etc.); chronic use of N_2O may cause increased rates of kidney and liver disease, miscarriages and birth defects, and increased cancer rates

Nitrogen Peroxide

See Nitrogen Oxides.

Nitrogen Trioxide

See Nitrogen Oxides.

Nitrous Fumes

See Nitric Acid.

Nitrous Oxide

See Nitrogen Oxides.

Nitroxanthic Acid

See Picric Acid.

Non-Aqueous

A substance which does not contain water.

Non-Reactive

Pertaining to constituents which do not chemically interact with or change in the presence of other materials.

Non-Threshold Carcinogens

Carcinogens which pose a threat to human health at any exposure level.

No-Observed-Adverse-Effect-Level (NOAEL)

Dose level at which no adverse effects are noted in the exposed population.

No-Observed-Effect-Level (NOEL)

Dose level at which no effects are noted in the exposed population.

Norway Saltpeter

See Ammonium Nitrate.

NO$_x$

See Nitrogen Oxides.

Nuisance Impacts

These may include noise, dust, odours and visual intrusion which may disrupt the day-to-day activities of residents near a facility and/or the use and enjoyment of the property.

O

Ocean Dumping

Description: A number of inert substances are dumped into ocean waters from ships, platforms and other man-made structures at sea.

Wastes Handled: According to federal regulations, the only substances that may be disposed of at sea are those that are rapidly rendered harmless by physical, chemical or biological processes of the sea and which do not render normally edible marine organisms inedible or do not endanger human or animal health.

Availability: Ocean dumping permits are issued by the federal Department of the Environment. (Also see At Sea Incineration.)

Odourless Mineral Spirits

See Naphtha.

Odour Threshold

Lowest level of an odour that human olfactory senses can detect.

Off-Site

Off the premises of a facility.

OH&S

Occupational Health and Safety.

Oil of Turpentine

See Turpentine.

Oil of Vitriol

See Sulphuric Acid.

Olefiant Gas

See Ethylene.

Olow

See Lead.

One-Train Incineration System

An incineration system consisting of several pieces of equipment (or unit operations) arranged so that the process materials flow from one piece to the next in sequence. There is only one of each piece of equipment (or unit operation), not including spares. The sequence of equipment is known as the "train" of equipment.

Ontario Regulation 346 (Reg. 346)

The legislation under *Ontario's Environmental Protection Act* which governs air emissions in the Province.

Ontario Regulation 347 (Reg. 347)

The legislation under *Ontario's Environmental Protection Act* which governs the identification, classification, registration and transportation of registerable liquid industrial and hazardous wastes in the province.

Ontario Water Resources Act (OWRA)

The legislation which provides the regulatory control over the discharge of contaminants into any natural waters in Ontario. (The *Ontario Water Resources Act* and the *Environmental Protection Act* are similar in function and structure.)

Opacity

The optical density of a material; the opposite of transparency.

o-Phosphoric Acid

See Phosphoric Acid.

Organic

A compound containing carbon.

Organic Neurotoxins

Substances containing carbon which damage the nervous system.

Organic Solutions

A homogeneous mixture of two or more substances with the largest concentration being carbon containing compounds.

Organic Waste

Waste containing chemicals of basically carbon structure, such as hydrocarbons and their derivatives.

Organochlorine Compounds

See Chlorinated Hydrocarbons.

Organomercurials

See Mercury.

Organometallic Complexes

Organic compounds containing metals.

Organophosphates

Synonyms: organophosphorus compounds
Description: a family of pesticides (most are insecticides) which are derivatives of phosphoric acid; many are combustible; less persistent in the environment than the chlorinated hydrocarbons
Uses: insecticides include azinphosmethyl (Guthion), carbophenothion (Trithion), chlorfenvinphos (Birlane), chlorpyrifos (Dursban), demeton (Systox), diazinon (Spectracide), dimethoate (Cygon, Rogor), fenitrothion (Sumithion, Accothion), fenthion (Baytex, Entex, Spotlon), isofenphos (Amaze), malathion (Cynthion), methamidophos (Monitor), methidathion (superacide), mevinphos (Phosdrin), parathion, phorate (Thimet), phosalon (Zolone), phosmet (Imidan), temephos (Abate), TEPP, terbufoss (Counter)
Health Hazards: with a few notable exceptions, all are extremely toxic (they act as irreversible chloinesterase inhibitors, disrupting the nervous system); may be inhaled or absorbed across the skin; mild exposure may result in anorexia, headache, dizziness, weakness, tremors of the tongue and eyelids, visual impairment; moderate doses may cause tightness in the chest and throat, mental

confusion, nausea, salivation, cramps, vomiting, sweating, slow pulse, muscle tremors; high levels may cause diarrhea, loss of reflexes, respiratory difficulty, pulmonary edema, convulsions, coma and heart block; repeated exposures may increase susceptibility and severity of effect; continued absorption may cause an influenza-like illness (weakness, anorexia, malaise), and may stimulate emotional or mental illness

Orthophosphoric Acid

See Phosphoric Acid.

OWMA

Ontario Waste Management Association.

OWMC

Ontario Waste Management Corporation.

OWMC Goals

Aims which have been developed and adopted by OWMC to guide its facility development process. The three goals are: (i) to minimize risk to human health; (ii) to minimize environmental impact; and (iii) to minimize financial costs to OWMC and the people of Ontario.

OWRA Facility

A facility which has a Certificate of Approval under the *Ontario Water Resources Act*. All direct discharges to Ontario's rivers and lakes require such approval.

Oxa-4-Azacyclohexane

See Morpholine.

Oxacyclopentadiene

See Furans.

Oxamyl

See Carbamates.

Oxidation

Generally, a process in waste management in which oxygen is used to produce materials which are more stable and/or less toxic.

Oxidation (Chemical)

Description: process used to detoxify hazardous wastes. An oxidizing agent (such as chlorine, ozone, potassium permanganate, sodium hypochlorite, calcium hypochlorite, hydrogen peroxide, etc.) is added to the waste stream in order to break chemical bonds and convert hazardous components into simpler, less toxic substances. An oxidation reaction is one in which electrons are transferred from a reducing agent to an oxidizing agent, raising its oxidation state. Oxidation (involving the loss of electrons) and reduction (the gain of electrons) always occur simultaneously, and are commonly known as redox reactions.
Wastes Handled: can be used to detoxify or break down organic and inorganic compounds (including cyanides, pesticides, phenols, etc.) in aqueous waste streams.
Availability: a widely used industrial process and waste management technique. (Also see Reduction (Chemical).)

Oxidation Pond

See Waste Stabilization Pond.

Oxidize

To combine with oxygen, or to accept electrons in a chemical reaction.

Oxidizing Agents

Substances which cause other substances to combine with oxygen or increase their valency (i.e. accept electrons).

Oxirane

See Ethylene Oxide.

Oxole

See Furans.

Oxomethane

See Formaldehyde.

Oxomethylene

See Formaldehyde,

Oxychlorure de Carbone

See Phosgene.

Oxyde de Calcium

See Calcium Oxide.

Oxyde de Carbone

See Carbon Monoxide.

Oxyde de Propyläne

See Propylene Oxide.

Oxyde Nitrique

See Nitrogen Oxides.

Ozon

See Ozone.

Ozonation

Description: Ozone is mixed with an aqueous or gaseous waste stream to oxidize contaminants. The process may be suitable for either primary scale treatment or final polishing before discharge.
Wastes Handled: Feasibility studies indicate the process can handle chlorinated hydrocarbons, phenols, cyanides, pesticides and other oxidizable materials.
Availability: The technology for large-scale ozonation is well developed, with laboratory and pilot-scale research complete. Ozonation has been used extensively as an alternative to the chlorination of drinking water. (Also see Oxidation (Chemical).)

Ozone

Formula: O_3
Synonyms: ozon, triatomic oxygen
Description: colourless gas or dark blue liquid with a distinctive, "electrical" smell which becomes disagreeable and sulphur-like at higher levels; liquid is a severe explosion hazard when exposed to heat, flame or shock; ozone is unstable and very reactive; a strong oxidant, incompatible with rubber and all organic and inorganic oxidizable materials; may react violently with many materials, including alkylmetals, acetylene, aromatic compounds, combustible gases, nitrogen, many organic liquids and solvents, ethylene, and oxygen fluorides
Uses: used as a disinfectant in public water supplies, swimming pools and sewage treatment plants; used as a bleach for waxes, textiles, mineral oils and their derivatives, paper pulp, flour, starch, and sugar; also used for ageing liquor and wood, in treating industrial wastes, for the rapid drying of varnishes and inks, for processing certain perfumes, and as an oxidizing agent in the chemical industry; generated directly from high-voltage electrical equipment (such as arc welders, X-ray machines, photcopiers, etc.); formed by the action of ultraviolet (UV) radiation on emissions from automobiles and factories; common air pollutant and key component in photochemical smog
Health Hazards: reactive gas attacks most tissues, including respiratory tract and lungs (leading to irritation, lung lesions, edema, hemorrhage, lung fibrosis, allergic reactions, and other breathing problems); may also affect the blood, central nervous, endocrine and reproductive systems; acute symptoms include shallow breathing, choking and coughing, watering of the eyes, dizziness, headache, visual impairment and reduced night vision, severe fatigue, inability to concentrate, low blood pressure and slow pulse rate; chronic exposure may cause more severe lung impairment

P

Packed Tower Air Stripper

See Air Stripping.

PACT

See Carbon Adsorption.

PAH

See Polynuclear Aromatic Hydrocarbons.

Painters Naphtha

See Naphtha.

Parathion

See Organophosphates.

Partial Solidification

An OWMC term describing a scenario whereby the dewatered sludge, after pretreatment, is solidified and the liquid effluent discharged.

Particulates

Fine solid material entrained in the flue gas.

Partition Coefficient

The ratio of a given contaminant concentration held within one phase (i.e. the solid phase), to that which is held within another phase (i.e. the liquid phase) at equilibrium.

Part V Facility

Waste treatment operation such as filtration and solidification which has a Certificate of Approval as a waste management system under Part V of the Environmental Protection Act.

Pathogenic Wastes

Wastes capable of causing disease.

Pathological Waste

(1) Human anatomical waste (including any part of the human body except teeth, hair, nail clippings and the like); or (2) animal anatomical waste (all or part of a carcass suspected of being infected with a disease communicable to humans or animals); and (3) all other non-anatomical waste infected with communicable disease from any source including public and commercial laboratories and hospitals. (Also see Biological Hazardous Wastes, Biomedical Wastes, and Infectious Waste.)

Pb

See Lead.

PBB

See Polybrominated Biphenyls.

PCB

See Polychlorinated Biphenyls.

PCC

See Primary Combustion Chamber.

PCDD

See Dioxins.

PCDF

See Furans.

PCE

See Perchloroethylene.

PCP

See Pentachlorophenol.

PCT

See Polychlorinated Terphenyls.

Pebble Lime

See Calcium Oxide/Hydroxide.

Pedology

The science of soils, their origin, character, and utilization.

Penchlorol

See Pentachlorophenol.

Pentachlorophenol

Formula: C_6Cl_5OH
Synonyms: Dowicide EC-7, Guardsman, Monsanto Penta, PCP, Penchlorol, Permatox, Santobrite, Santophen 20, Stangard, Thompson's Wood Fix, Tim-Ber-Lux, Woodlife
Description: white to dark brown crystalline solid, flake or powder with a weak phenolic odour (which becomes more pungent on heating); PCP is usually diluted to a 5% solution using mineral spirits, fuel oil or kerosene; very slightly soluble in water (sinks); pure forms are inflammable, but emit toxic chlorine fumes when heated to decomposition; incompatible with strong oxidizers
Uses: used in the treatment and preservation of wood (utility poles, railroad crossties, fence posts, timbers and pilings); insecticides and herbicides; also used as a bactericide, fungicide or slimicide in paints, textiles and leathers, drilling muds, photographic solutions, disinfectants, health care products, and industrial cooling system
Health Hazards: a highly toxic chlorophenol compound which may also be contaminated with dioxins and furans; may cause skin irritation, and chloracne following prolonged exposure; may be absorbed across skin; acute effects include violent sneezing and coughing, sweating and fever, rapid pulse, headache, dizziness, nausea, chest pains, destruction of red blood cells, weakness, shortness of breath, and at high levels, convulsions, loss of consciousness and death; chronic effects may include weight loss, and liver and kidney damage; an experimental teratogen

Peptization

Method of getting substances into colloidal suspension by breaking down larger particles. The term is loosely applied to the softening or liquefaction of one substance by trace quantities of another.

Perc

See Perchloroethylene.

Perchlorethylene

See Perchloroethylene.

Perchloroethylene

Formula: $Cl_2C{=}CCl_2$
Synonyms: carbon dichloride, dry cleaning fluid, ethylene tetrachloride, PCE, perc, perclene, perchlorethylene (Fr.), tetrachloroethene, tetrachloroethylene
Description: clear, colourless liquid with a conspicuous, ether-like odour; insoluble in water (sinks); nonflammable, but releases toxic chloride fumes when heated to decomposition; reacts violently with concentrated nitric acid, barium, beryllium, lithium, and strong oxidizers
Uses: widely used solvent in the dry cleaning and degreasing fields; also used as a chemical intermediate, a fumigant, and in the manufacture of fluorocarbons
Health Hazards: not acutely dangerous, but toxic by inhalation or following prolonged exposure; a carcinogen; irritates nose, eyes and throat; absorbed across skin causing inflammation, dryness, blisters and dermatitis; inhalation may cause headache, intoxication, nausea and vomiting, drowsiness, blurred vision, staggering, confusion, narcosis, loss of consciousness, and coma

Perchloromethane

See Carbon Tetrachloride.

Perchlorure de Fer

See Ferric Chloride.

Perclene

See Perchloroethylene.

Perhydrol

See Hydrogen Peroxide.

Permatox

See Pentachlorophenol.

Permeability

The property of soil, rock or other material that allows passage of water through it. Depends not only on the volume of openings and pores, but also on how these openings are connected to each other.

Permeable

Open to passage or penetration; used especially for a substance that allows the passage of fluids.

Permeable Treatment Beds

Description: A groundwater remediation technique, permeable treatment beds are excavated trenches situated perpendicular to groundwater flow and filled with a material suitable for the treatment of the flow. Fill may include limestone (to neutralize acids), activated carbon (to remove non-polar organic compounds), glauconitic green sands (for retaining various heavy metals), ion exchange resins, crushed shells, etc.
Wastes Handled: The ability of the system to trap contaminants depends on the filler material used and the depth and flow of the leachate plume.
Availability: The technique has been tested at the bench and pilot-scale. (Also see Filtration.)

Permits

Official approval and permission to proceed with an activity controlled by the permitting authority.

Peroxan

See Hydrogen Peroxide.

Peroxide

See Hydrogen Peroxide.

Peroxyde d'Hydrogene

See Hydrogen Peroxide.

Perpetual Care

Maintenance and/or monitoring of a disposal facility which must be undertaken continually and eternally.

Perthane

See Chlorinated Hydrocarbons.

Pesticides

See Carbamates, Chlorinated Hydrocarbons, Chlorophenoxy Compounds, and Organophosphates.

Pervaporation

Description: A membrane separation process which uses a partial vacuum to remove the vapour component of a liquid stream. In other configurations a carrier gas may be used to transport the permeated product.
Wastes Handled: The process may be used as an alternative to distillation for mixtures of close-boiling components. It can also be used to separate heat-sensitive substances or other difficult to separate mixtures.
Availability: High energy costs and membrane-related design problems mean that pervaporation is not currently employed on an industrial scale.

Petrohol

See Isopropyl Alcohol.

Petrol

See Gasoline.

Petroleum Ether or Naphtha

See Naphtha.

pH

A measure of the acidity or alkalinity of a substance. It is expressed on a logarithmic scale based on the hydrogen ion concentration. A pH of 7.0 indicates precise neutrality, higher values indicate increasing alkalinity and lower values indicate increasing acidity.

Phase Separation

Separation of immiscible liquids or slurries so the two phases can be treated separately.

pH Control

See Neutralization.

Phene

See Benzene.

Phenol

Formula: C_6H_5OH
Synonyms: acide carbolique (Fr.), benzophenol, carbolic acid, fenol, fenolo, hydroxybenzene, monohydroxybenzene, phenyl hydrate or hydroxide, phenylic acid or alcohol,
Description: white crystalline mass (or liquid) which turns pink or red in the light; distinctive odour (sharp, sweet, medicinal) and a sharp burning taste; soluble in water (floats and mixes); combustible, emitting toxic phenol fumes when heated; can react with oxidizing materials, and when hot, reacts with aluminum, magnesium, lead and zinc
Uses: used in the production of phenolic resins (primarily for plywood and wafer board), dyes, drugs, biocides, lab reagents, explosives, paints and paint removers, fertilizer, textiles, lampblack, rubber, asbestos goods, perfumes and plastics; in wide use as a disinfectant
Health Hazards: inhalation will irritate the respiratory tract, depress the central nervous system, and may cause headache, a ringing in the ears, sweating, coughing, weakness, difficulty breathing, vomiting, nausea, diarrhea, pulmonary edema, convulsions, coma, and death; can be readily absorbed across the skin; liver and kidney damage; contact may cause irritation and severe burns (although no pain is felt at first) to skin and eyes, gangrene and loss of vision; experimental carcinogen

Phenolic Wastes

Wastes containing phenols.

Phenols

Organic compounds that contain one or more hydroxyl groups (OH) bound directly to a benzene ring. They are by-products of petroleum refining, textile, dye and resin manufacturing.

Phenol Trinitrate

See Picric Acid.

Phenylamine

See Aniline.

Phenylethane

See Ethylbenzene.

Phenylethene

See Styrene.

Phenylethylene

See Styrene.

Phenylhydrate

See Phenol.

Phenylhydride

See Benzene.

Phenylhydroxide

See Phenol.

Phenylic Acid

See Phenol.

Phenylic Alcohol

See Phenol.

Phenylmethane

See Toluene.

Phorate

See Organophosphates.

Phosalon

See Organophosphates.

Phosdrin

See Organophosphates.

Phosgen

See Phosgene.

Phosgene

Formula: $COCl_2$
Synonyms: carbonic acid dichloride, carbon oxychloride, carbonylchloride, chloroformyl, combat gas, fosgen, fosgeen, fosgene, oxychlorure de carbone (Fr.), phosgen
Description: colourless gas with a sweet odour, which is pleasant (like new-mown hay) at low concentrations but pungent and irritating at higher levels; slightly soluble in water (sinks) but decomposes to toxic carbon monoxide and hydrochloric acid); noncombustible; reacts violently with aluminum, isopropyl alcohol, potassium, and sodium
Uses: used in the manufacture of dyestuffs, organic synthesis, and metallurgy; the burning of many chlorinated compounds will generate phosgene gas
Health Hazards: irritates eyes and respiratory tract, but dangerous amounts can be inhaled with no warning (symptoms may not appear for 2-24 hours after exposure); inhalation may cause burning in the throat, dizziness, chills, discomfort, thirst, increasing cough, suffocating feeling, pulmonary edema, pneumonia, and death by respiratory or cardiac failure; prolonged exposure may result in irreversible emphysema and lung fibrosis; was once suspected in Legionnaire's disease (but since cleared)

Phosmet

See Organophosphates.

Phosphore Blanc

See Phosphorus.

Phosphoric Acid

Formula: H_3PO_4
Synonyms: acide phosphorique (Fr.), orthophosphoric acid
Description: an odourless, colourless-to-amber, sparkling liquid (may be syrupy depending on strength), or a clear, crystalline solid; soluble in water (sinks and mixes); not combustible, but releases toxic POx fumes when heated to decomposition; reacts with some metals to emit flammable hydrogen gas
Uses: used in the production of ammonium phosphate fertilizers, food and beverages, soaps and detergents, pharmaceuticals, waxes and polishes, and activated carbon; also used in metal finishing and rustproofing, water treatment, and dyeing; a gasoline additive
Health Hazards: low toxicity; if inhaled, may irritate mucous membranes and cause difficulty breathing and nausea; contact may irritate or burn skin and eyes

Phosphorus

Formula: P_4
Synonyms: fosforobianco, gelber phosphor, phosphore blanc (Fr.), white phosphorus, yellow phosphorus
Description: a colourless to white to pale yellow, odourless solid with a waxy appearance; very slightly soluble in water (sinks); ignites spontaneously upon contact with air, releasing intense white fumes of highly irritating P_4O_{10}, other oxides of phosphorus and high heat; reacts explosively with some oxidizing materials, violently with a long list of compounds, including strong caustics and elemental sulphur; the related red phosphorus (P) is virtually nontoxic, although it may emit dangerous white phosphorus fumes on heating
Uses: used to make phosphoric acid (use in the manufacture of many products and compounds)
Health Hazards: one of the most toxic inorganic substances; contact may cause severe, deep burns to the skin and eyes; may be absorbed through the skin; inhalation may cause photophobia, dilation of the pupils, retinal bleeding, congestion of the blood vessels, coughing, weakness, malaise, headache, vertigo, bronchitis, acute pulmonary edema, and liver damage; chronic exposure may cause rapid deterioration of the teeth, intense salivation, and blood, bone (especially the jaw bone) and urinary effects; the bones may become fragile

Photodegradation

See Photolysis.

Photolysis

Description: A process that uses either artificial or natural light energy (usually ultraviolet or UV radiation) to break chemical bonds in solid, liquid and gaseous waste streams. The final products are carbon dioxide, water and simple mineral acids. Reagents (such as chlorine, ozone and titanium dioxide) are commonly used to enhance the oxidation reaction.

Wastes Handled: Most halogenated organics, including DDT, PCBs and dioxins, have been shown to undergo photodegradation. Contaminated soils and sludges have also been the subject of some promising photolysis research.

Availability: UV treatment is commonly used for sterilization (the radiation penetrates bacteria and impairs DNA functioning). UV radiation has also been used as an alternative to chlorination or ozonation in the treatment of drinking water and industrial process water. A number of different waste treatment configurations are under investigation in laboratory-scale tests.

Photooxidation

See Photolysis.

Phthalate

Organic compounds widely used in the manufacturing of plastics. Generally these refer to the esters of 1,2-benzenedicarboxylic acid (phthalic acid) — the result of reaction of phthalic acid with various alcohols.

Physical/Chemical Treatment

Description: Processes that use physical or chemical means to detoxify, break down, stabilize, or reduce a waste stream.

Wastes Handled: Systems are available for handling a full range of hazardous and nonhazardous wastes, including liquids, sludges and solids containing both organic and inorganic contaminants.

Availability: Also see Air Stripping, Blending/Equalization, Carbon Adsorption, Catalysis, Centrifugation, Chemical Dechlorination, Chlorinolysis, Dialysis, Dissolution, Distillation, Electroacoustical, Electrodialysis, Electrolysis, Electrophoresis, Emulsion Breaking, Emulsion Liquid Membrane Separation, Evaporation, Filtration, Flocculation, Flotation, Freeze Drying, High Gradient Magnetic Separation, Hydraulic Jet Mixing, Hydrolysis, Injection Grouting, Ion Exchange, Liquid-Liquid Extraction, Neutralization, Oxidation, Ozonation, Permeable Treatment Beds, Pervaporation, Photolysis, Reduction, Resin Adsorption, Reverse Osmosis, Sedimentation, Steam Stripping, Suspension Freezing, Ultrafiltration, Vacuum Extraction, Vapour Extraction, and Zone Refining.

PIC

Product of incomplete combustion.

Pickle Liquor

Spent hydrochloric or sulphuric acid solutions used in metal finishing, mainly to remove the build-up of scale.

Picric Acid

Formula: $C_6H_3N_3O_7$

Synonyms: acide picrique (Fr.), carbazotic acid, nitroxanthic acid, phenol trinitrate, picronitric acid, pikrinzuur, pikrynowy kwas, trinitophenol

Description: odourless yellow crystals with a very bitter taste; soluble in water; severe explosion risk when shocked or heated; may decompose to emit toxic fumes of carbon dioxide, carbon monoxide and nitrogen oxides; reactive with metals (especially copper, lead and zinc) and metallic salts, ammonia, bases, and concrete

Uses: used in the production of explosives, fireworks, matches, rocket fuels, and electric batteries; also used in etching copper and steel, textile dyeing, the leather industry, photographic emulsions, pharmaceuticals, disinfectants, and as a reagent

Health Hazards: potent skin sensitizer leading to allergic skin reactions, yellow staining, lesions, dermatitis, and eye irritation; absorbed through skin; may cause chronic kidney and liver damage

Picronitric Acid

See Picric Acid.

Piezometer

A pipe or tube in the ground which allows for the determination of water level elevation. It is usually constructed with a slotted pipe or screen at the bottom that permits inflow of water but not geologic materials. It is sealed below the screened section, and it is open to the atmosphere at the top.

Pikrinzuur

See Picric Acid.

Pikrynowy Kwas

See Picric Acid.

P-isoxamzine

See Morpholine.

Pit

A pit is an excavation or the removal of unconsolidated materials such as sand and gravel.

Pixalbol

See Coal Tar.

Plasma Arc Destruction

Description: Plasma arc technology uses a plasma-arc device to create extremely high temperatures (approximating 10,000°C) for the destruction of highly toxic wastes. (A plasma is an extremely hot gas consisting of charged and neutral particles with a net overall charge of zero; a gas is energized to its plasma state by an electrical discharge.) Wastes fed into the plasma zone absorb the energy radiated by the ionized gas molecules and undergo pyrolysis and are atomized and destroyed. Gaseous emissions (mostly hydrogen and carbon monoxide), acid gases from the scrubbers, and ash components in the scrubber water are the primary residuals. Off-gases pass on to the air pollution control system for further treatment. Product gas is drawn off and flared directly.

Wastes Handled: Depending on the design, the plasma arc technology can be applied to liquid and solid wastes.

Availability: The technology is undergoing testing. (Also see Pyrolysis, and Thermal Treatment.)

Plenum Chamber

A portion of a duct work system which has an enlarged volume to enhance even distribution of flow to multiple downstream outlets.

Plume

Dispersion path taken by materials through geological formations from a site, or by emissions from a smokestack.

PNA

See Polynuclear Aromatic Hydrocarbons.

POHC

See Principal Organic Hazardous Constituents.

Point Source

A discernible, confined, and discrete conveyance, including, but not limited to a pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, or vessel or other floating craft from which pollutants are or may be discharged. Does not include return flow from irrigated agriculture.

Polished Effluent

Liquid effluent which has been subjected to final stages of a physical/chemical treatment process to reduce residual concentrations of suspended solids, dissolved inorganics (including total dissolved solids in general) and dissolved organic contaminants prior to being recycled, evaporated or discharged.

Pollution

Contamination of air, water, land or other natural resources that will or is likely to create a public nuisance or to render such air, water, land or other natural resources harmful, detrimental or injurious to public health, safety or welfare, or to domestic, municipal, commercial, industrial, agricultural, recreational or other legitimate beneficial uses, or to livestock, wild animals, birds, fish or other life. (Also see Contamination.)

Pollution Abatement

Process designed to reduce pollution.

Polyaromatic Hydrocarbons (PAHs)

See Polynuclear Aromatic Hydrocarbons.

Polybrominated Biphenyls

Synonyms: Firemaster, hexabromobiphenyl, PBB
Description: a family of heavily brominated compounds; emit very toxic bromine fumes when heated to decomposition
Uses: used as fire retardants and incorporated into thermoplastics (used to make thermostats, handtools, typewriters, radio and television parts, etc.)
Health Hazards: bioaccumulate in fatty tissues; human effects unknown; animal studies show anorexia, birth problems, and liver and kidney damage; an animal carcinogen and teratogen

Polychlorinated Biphenyls

Formula: $C_{12}H_{10-n}Cl_n$
Synonyms: Arochlor, askarel, chlorodiphenyls, Hyvol, Inerteen, Kanechlor, PCB, Pyranol
Description: a family of persistent, chlorinated aromatic hydrocarbons with 209 possible isomers; low solubility in water (floats); nonflammable, but emits very toxic chlorine fumes when heated to decomposition
Uses: once widely used (in waxes, adhesives, paints, pesticides, inks, caulking compounds, carbonless carbon paper, etc.) now restricted to use in electrical insulating fluids in capacitors and transformers; PCBs no longer being produced, and being phased out of use
Health Hazards: some controversy exists over human health effects; contact may cause chloracne and skin irritation; may be absorbed across the skin; inhalation may irritate nose and throat, and cause nausea, vomiting, weight loss, jaundice, edema, coma and death; both acute and chronic exposure may cause liver damage; bioaccumulates in fatty tissues; certain isomers have caused cancers in experimental animals

Polychlorinated Dibenzo-p-dioxins

See Dioxins.

Polychlorinated Dibenzo-p-furans

See Furans.

Polycyclic Aromatic Hydrocarbons

See Polynuclear Aromatic Hydrocarbons.

Polyelectrolytes

Used as flocculants, dispersants or anti-static agents. Polyelectrolytes are high molecular weight polymer substances (either natural or synthetic) containing ionic constituents.

Polymer

A molecule formed by the chemical union of 5 or more identical combining units called monomers, An example is polyvinyl chloride (PVC).

Polymerization

A chemical reaction in which a large number of relatively simple molecules combine to form a chain-like macromolecule.

Polynuclear Aromatic Hydrocarbons

Synonyms: PAHs, PNAs, polycyclic aromatic hydrocarbons, polynuclear organic materials, POMs
Description: family of toxic compounds containing two or more aromatic (benzene)

rings; includes benzo-a-pyrene, acenaphthene, fluoanthene, and naphthalene
Uses: common air pollutants formed in any hydrocarbon (fossil fuels, wood, etc.) combustion process (such as heat/power generation, industrial activity, transportation, refuse burning, etc.), or released from oil spills
Health Hazards: some PAHs have been shown to be carcinogenic in animal tests; may build up in fatty tissues

Polynuclear Organic Materials
See Polynuclear Aromatic Hydrocarbons.

POM
See Polynuclear Aromatic Hydrocarbons.

Post-Closure Care
Means the monitoring and maintenance activities conducted after closure of any waste treatment/ disposal facility.

Potable Water
Water suitable for drinking.

Potassa
See Potassium Hydroxide.

Potasse Caustique
See Potassium Hydroxide.

Potassium Cyanide
See Cyanides.

Potassium Hydrate
See Potassium Hydroxide.

Potassium Hydroxide
Formula: KOH
Synonyms: caustic potash, hydroxyde de potassium (Fr.), lye, potassa, potasse caustique (Fr.), potassium hydrate
Description: either a clear, colourless liquid or a white solid with no odour; soluble in water (mixes readily and sinks), the solid form generating heat; not flammable, but may cause ignition when in contact with organic materials; when wet, may attack aluminum, tin, lead, and zinc to generate hydrogen gas; reacts violently with a number of compounds
Uses: used in soap manufacture, bleaching, dyestuffs, liquid fertilizers, herbicides, electroplating, and the manufacture of potassium carbamate and other chemicals; also used as an electrolyte in strong batteries and some fuel cells, a food additive, paint remover, and an absorbent (for carbon dioxide and hydrogen sulphide)
Health Hazards: a very strong irritant, attacking the skin, eyes, upper respiratory tract and lungs; contact may cause severe burns

Potency
A measure of the relative strength of a chemical.

Powdered Activated Carbon
See Carbon Adsorption.

ppb
Parts per billion.

ppm
Parts per million.

Precipitate
Small particles that have settled out of a liquid or aqueous suspension by gravity or that result from a chemical reaction.

Precipitation
A physical/chemical technology in which dissolved chemical species in solution (e.g., metals) are transformed into a solid phase (precipitate) which can be subsequently separated from the solution by physical means. (Also see Sedimentation/Precipitation.)

Primary Combustion Chamber (PCC)
A combustion chamber is any chamber in which fuel is burned to provide heat. A

primary combustion chamber refers to the chamber in which burning is initiated. (Also see Afterburner, and Secondary Combustion Chamber.)

Primary Treatment

The first stage of physical/chemical treatment designed to prepare certain wastes for subsequent treatment. Phase separation, blending and dissolution are examples of primary treatment processes. (Also see Secondary and Tertiary Treatment.)

Primary Waste

Waste generated directly as the result of an industrial, commercial or domestic activity. For wastes shipped off-site for treatment and disposal, primary wastes are the quantities going to their "first time" destinations.

Principal Organic Hazardous Constituents (POHCs)

During a test burn or performance test, POHCs are monitored in both the waste feed and emissions to measure the destruction and removal efficiency (DRE) of an incinerator.

Processing

Unit operations used for the purpose of reducing the amount (either volume or bulk) of municipal or industrial waste, to convert part or all of such waste materials for off-site reuse, or to convert wastes into more stable and environmentally safe materials.

Products of Incomplete Combustion (PICs)

Materials formed as a result of partial oxidation of chemicals in the waste feed due to the combination of molecular fragments outside the combustion zone.

Propane

Formula: $CH_3CH_2CH_3$
Synonyms: dimethylmethane, LPG, propyl hydride
Description: a colourless gas (usually shipped in liquid form) that is odourless, unless foul smelling mercaptans have been added; slightly soluble in water (liquefied propane floats and boils); flammable and explosive (flashback may occur along vapour trails); reacts strongly with oxidizing agents, violently with chlorine dioxide
Uses: used for organic synthesis, and the manufacture of ethylene; also used as a household and industrial fuel, refrigerant, extractant, solvent, gas enricher, and aerosol propellant
Health Hazards: acts as an asphyxiant; causing rapid irregular breathing, headache, dizziness and disorientation, fatigue, nausea and vomiting, convulsions, and loss of consciousness; contact with liquefied form may cause frostbite, burning

2-Propanol

See Isopropyl Alcohol.

2-Propanone

See Acetone.

Propellant

See Chlorofluorocarbons.

Propene

See Propylene.

Propenenitrile

See Acrylonitrile.

Propene Oxide

See Propylene Oxide.

Propham

See Carbamates.

Propoxur

See Carbamates.

Propylene

Formula: $CH_3CH{:}CH_2$
Synonyms: methylethene, methylethylene, propene

Description: a colourless gas (may be shipped as a liquid) with a mild, aromatic odour; slightly soluble in water (liquefied form floats and boils); highly flammable and explosive (flashback may occur along vapour trails); can react vigorously with oxidizing materials, violently with nitrogen oxides
Uses: used in the manufacture of isopropyl alcohol, polypropylene, synthetic glycerol, acrylonitrile, propylene oxide, cumene, polymer gasoline, acrylic acid, vinyl resins, and OXO chemicals
Health Hazards: a mild toxic and asphyxiant; inhalation may cause headache, fatigue, mental confusion, nausea and vomiting, convulsions, and loss of consciousness; contact with liquid form may cause frostbite

Propylene Oxide

Formula: CH_3CHOCH_2
Synonyms: epoxypropane, methyl ethylene oxide, methyl oxirane, oxyde de propyläne (Fr.), propene oxide
Description: colourless liquid with a sweet, ether-like odour; partially soluble in water (mixes); highly flammable and explosive (flashback may occur along vapour trails); can react vigorously with oxidizing materials, reacts violently with copper and copper alloys, ammonium hydroxide, and a number of acids
Uses: used in the production of polyols (for urethane foams) and propylene glycols (widely used industrial chemical, solvent and food additive); also used in surfactants and detergents, synthetic lubricants, solvents, and fumigants
Health Hazards: inhalation may irritate the nose, throat and lungs, and cause headache, nausea, and possible loss of consciousness; contact may cause skin irritation, burns, and blisters, and corneal burns

Propyl Hydride

See Propane.

Prussic Acid

See Hydrogen Cyanide.

Purge Wells

Wells drilled as a contingency measure to the bedrock aquifer along the gradient property boundary to collect groundwater for treatment.

PVC

Polyvinyl Chloride.

Pyranol

See Polychlorinated Biphenyls.

Pyretron

See Advanced Oxygen Combustion.

Pyrobenzol

See Benzene.

Pyroligneous Acid

See Acetic Acid.

Pyrolysis

Description: A thermal process for decomposing (not burning) organics in an oxygen-free environment. Frequently, the heat is delivered by infra-red radiation. Organics are reduced (under temperatures between 600°-900°C) to steam, oxides of carbon, volatile vapours (methane, hydrogen, and complex hydrocarbons) and charcoal. Off-gases may be burned in the afterburner (with an excess of oxygen), used as an auxiliary fuel source or be ducted to air pollution control equipment for further treatment before discharge to the atmosphere. Frequently, the heat is delivered by infra-red radiation.
Wastes Handled: The system can handle organic and inorganic wastes in liquid, sludge, solid or bulk form. Pyrolysis is especially appropriate for viscous and abrasive sludges, high-residue materials, and salts/metals that would melt or volatize under higher incineration temperatures (possibly damaging the reactor). Pyrolysis systems could also be used to recover energy from municipal solid wastes.

Availability: A number of commercial units are available. (Also see Advanced Electric Reactor, Incineration, and Thermal Treatment.)

Pyrrolylene

See 1,3-butadiene.

Q

Quench

Shock cooling by immersing liquid gas, molten or heated material into a cooling medium (liquid or gas).

Quick Lime

See Calcium Oxide.

Quick Silver

See Mercury.

R

Radiant Heat

The dissipation of heat or energy from an object at an elevated temperature to cooler temperature regions without the aid of air or gas motion.

Radioactive Wastes

As defined by Ontario Regulation 347, wastes which exhibit radioactivity (i.e. natural or artificial nuclear transformation) and are not Radioactive Prescribed Substances as defined by the federal *Atomic Energy Control Act.*

Radon

Description: very dense, colourless, odourless gas; chemically inert and relatively unreactive, radon may move through soil with ease
Uses: used in some medical treatments (although radon has been almost completely replaced by other radionuclides); also used as a tracer in scientific experiments and in prospecting for uranium, natural gas and oil fields; more common as naturally-occurring pollutant which may build up in homes, basements, mines and other enclosed, poorly ventilated spaces
Health Hazards: radon gas and its radioactive breakdown products (the so-called radon daughters) when carried into the lung may cause cancer

Raney Alloy

See Nickel.

Raw Flue Gases

Flue gases resulting from the incineration of organic waste. These gases normally contain contaminants such as acid gases and/or particulate matter, prior to their removal in a flue gas treatment system. (See Flue Gas.)

RDF

Refuse Derived Fuel

Reactive Waste

A reactive waste as defined by Ontario Regulation 347 is any material which: (1) is normally unstable and readily undergoes violent change without detonation; (2) reacts violently with water; (3) forms potentially explosive mixtures with water; (4) when mixed with water, generates toxic gases, vapours or fumes in a quantity sufficient to present a danger to human health or the environment; (5) is a cyanide or sulphide-bearing waste which, when exposed to conditions where the pH is between 2 and 12.5, can generate toxic gases, vapours, or fumes in a quantity sufficient to present a danger to human health or the environment; (6) is capable of detonation or explosive reaction if it is subjected to a strong initiating source or if heated under confinement; (7) is readily capable of detonation or explosive decomposition/reaction at standard temperature and pressure; or (8) is a explosive (Class 1) as defined in the regulations under the federal *Transportation of Dangerous Goods Act.*

Reactivity

The measure of the tendency of a compound to participate in a chemical reaction.

Reagent

See Additives and Reagents.

Receptors

Members of a potentially exposed population, such as plants, animals and human beings.

Reclamation

Restoration to a better or more useful state, such as obtaining useful materials from solid waste.

Recovery (3Rs/4Rs)

A process to reclaim components in waste which can be used in making other products.

The term is commonly used to refer to the recovery of energy from waste. See Resource Recovery.

Recycling (3Rs/4Rs)

A process to recover and reuse materials used in or resulting from a plant's production process either for separate use or direct reuse in-house.

Red Fuming Nitric Acid

See Nitric Acid.

Reducing Agent

A chemical which will donate electrons (negative changes) during a chemical reaction. The reducing agent becomes oxidized during the reaction. (Also see Oxidizing Agent.)

Reduction (3Rs/4Rs)

A process to decrease the amount of waste to be treated or disposed of.

Reduction (Chemical)

Description: Chemical reduction is used to lower the oxidation state of a substance in order to reduce its toxicity, solubility or otherwise change its form to one more easily separated. Reduction may occur in one of the following ways: (1) the acceptance of one or more electrons, (2) the removal of oxygen from a compound, or (3) the addition of hydrogen to a compound. Chemical reduction can be carried out by using a chemical reducing agent (Such as sulphur dioxide, sodium metabisulphite, or sodium bisulphite). Oxidation and reduction always occur simultaneously.
Availability: A widely used industrial process and waste management technique. (Also see Oxidation (Chemical).)

Refrigerant

See Chlorofluorocarbons.

Refuse Derived Fuel

See Waste Derived Fuel.

Regeneration Solvent

A liquid used to dissolve and remove contaminants collected on filtration screens, filtration media or ion exchange resins, consequently regenerating the filtration systems.

Registerable Solids

Solid wastes that contain contaminants listed in Schedule 4 of Ontario Regulation 347, such that they can leach out in concentrations between 10 and 100 times the concentrations shown in the Schedule when subjected to the Leachate Extraction Procedure included as part of Regulation 347.

Regulation 346

See Ontario Regulation 346.

Regulation 347

See Ontario Regulation 347.

Representative Sample

A sample of a population or a materials (such as a waste pile, lagoon, or groundwater) which can be expected to exhibit the average properties of the whole.

Residence Time

Within the context of incineration, residence time is the time that a waste is subjected to the combustion zone temperature in an incinerator and/or secondary combustion chamber.

Residual Waste

Nonhazardous waste (i.e., garbage, refuse, discarded material, or other materials) which may result from industrial operations, mining, agriculture, wastewater treatment, or air pollution control facility.

Residue

Solid or semi-solid materials such as, but not limited to ash, ceramics, glass, metal and minute quantities or organic substances remaining after incineration or processing. Also refers to semi-solid material such as filter cakes resulting from physical/chemical treatment of wastes.

Resin Adhesive (Synthetic)

A man-made adhesive, glue or binder that is mainly comprised of a polymer which is produced by the chemical reaction between two or more substances.

Resin Adsorption

Description: Small, hard beads of synthetic resins are used to physically and/or chemically adsorb organics from liquid solutions. Wastewater is passed through beds or columns packed with resin beads. The adsorbed materials are recovered and the resins are, in turn, regenerated by means of organic solvents, caustic, acid or steam (alternative carbon adsorption systems, because of the stronger bonds formed, often must be thermally regenerated). Temperature, pH and the wastewater constituents must be carefully controlled.

Wastes Handled: Resins are available to trap a wide range of both polar and nonpolar molecules from wastewaters. Applications include the removal of precious metals, dyes and colours, phenols, pesticides, chlorinated hydrocarbons and other organics. Resin adsorption is particularly attractive for removing organics from aqueous waste streams when material recovery is desirable and the waste stream contains high levels of dissolved inorganic salts. Suspended solids should be kept below 50 ppm and any strong chemicals that could react with the resin removed prior to treatment.

Availability: Many synthetic resins are commercially available and may be grouped in one of two basic types: polymeric adsorbents and carbonaceous resins. (Also see Carbon Adsorption, and Ion Exchange.)

Resource Conservation

Reduction of the amounts of solid waste that are generated and the reduction of overall resource consumption and utilization of recovered resources.

Resource Recovery

The extraction of useful materials (paper, solvents, glass, and metals) or energy from solid waste; materials that can be reprocessed and reused.

Reuse (3Rs/4Rs)

The utilization of a by-product as is or slightly refurbished, by a different person. ecycling unprocessed wastes and/or effluents in an environmentally safe way.

Reverse Electrodialysis

See Electrodialysis.

Reverse Osmosis (RO)

Description: This physical process employs a semi-permeable membrane that allows only certain components to pass through. In reverse osmosis high pressure is used to obtain adequate flow rates of relatively pure water through the membrane, concentrating dissolved components on the high pressure side of the membrane. Factors affecting performance include temperature, pH, concentration polarization, membrane compaction, fouling or scaling problems, and the presence of chlorine. Membranes may be arranged in flat, scrolled, straight tubular, helical tubular and hollow fibre configurations. RO is capable of rejecting (or concentrating) much smaller molecules (RO membranes have a pore size ranging from 0.0001 to 0.001 micron) than those rejected by ultrafiltration (0.001 to 0.02 micron) or microfiltration (0.02 to 10 microns).

Wastes Handled: RO is used to treat aqueous solutions containing dissolved species, both organic and inorganic. To prevent clogging, it is important to remove oils and suspended solids prior to treatment.

Availability: RO systems have been in use for many years for the production of potable supplies from sea water, for concentrating maple syrup, and for producing high quality water for industry. Industrial applications are growing. Advances are constantly being made in membrane formulation and configuration to improve reliability and removal efficiencies. (Also see Dialysis, Electrodialysis, and Ultrafiltration.)

RFNA

See Nitric Acid.

Rich Organic

Refers to a material with a high organic content. In terms of incineration a rich organic waste has a high heating value. (Also see Lean Organic.)

Risk

Probability of injury, disease, or death under specific circumstances. (Also see Chemical Risk Assessment, and Exposure Assessment.)

Risk and Impact Management Measures

Practices undertaken to prevent or minimize risks and adverse impacts and to enhance benefits. These include mitigation, compensation, monitoring and contingency measures.

RO

See Reverse Osmosis

Rocking Kiln Incineration

Description: The rocking kiln incinerator is a thermal destruction system similar to the rotary kiln. However, the primary chamber rotates up to 45° right and left of centre to re-expose incinerable waste to the high temperature oxidizing atmosphere, and periodically rocked through an arc up to 180° for the discharge of solid residues and ash. A second chamber is used to achieve almost complete combustion of volatile organics. Liquid wastes are atomized and burned in suspension. Operating temperatures range between 800°-1,200°C.

Wastes Handled: A versatile incinerator, it is capable of handling slurries, sludges, bulk solids of varying sizes, containerized wastes, and combustible and non-combustible liquid wastes.

Availability: Rocking kilns have been in commercial operation at the Alberta Special Waste Management Centre since 1987. (Also see Rotary Kiln Incineration, Incineration and Thermal Treatment.

Rock Salt

See Sodium Chloride.

Rogor

See Organophosphates.

Rotary Drum Filtration

See Filtration.

Rotary Kiln Incineration

Description: The rotary kiln is a cylindrical, refractory-lined shell mounted with its axis at a slight slope. Rotation of the shell mixes the wastes and moves them through the kiln. Solid wastes are burned in the rotating kiln, the first of the system's two chambers. Complete combustion of volatiles and vaporized materials is accomplished in the secondary combustion chamber, along with various liquid wastes. Operating temperatures range from 800°-1,400°C in the kiln and 1,000°-1,400°C in the secondary chamber. Gas residence time in the combustion zone is at least 2 seconds. Off-gases are directed to an air pollution control system.

Wastes Handled: A wide ranges of bulk organic solids, containerized wastes, sludges, slurries and liquids (including some of the most hazardous wastes) are burned in the kiln. Liquid and gaseous wastes may be used as auxiliary fuel in both the kiln and secondary chamber.

Availability: Rotary kilns are the most flexible and widely used incineration process for hazardous waste treatment, with a number of plant in operation around the world. Mobile systems are also available. (Also see Rocking Kiln Incineration, Incineration, and Thermal Treatment.)

Rotating Biological Contactor (RBC)

Description: A variation on the activated sludge process, the Canadian-designed RBC increases reaction speed and cuts costs by attaching aerobic microbe colonies to large wheels or disks that continuously rotate through the wastewater tank and the surface air. This fixed film reactor removes the need to pump air through the reactors and eliminates most misting and odour problems. The RBC system is less sensitive to fluctuations in load and other disturbances. However, because of a relatively brief retention time (1 to 2 hours), short-term peaks in toxic organics are more likely to pass through the system without complete treatment.
Wastes Handled: Industrial RBC systems have been used to treat wastes from food processing, chemicals/pharmaceuticals, refinery/petrochemical, munitions, textile/dyestuffs, leather, pulp and paper, and mining industries.
Availability: A well established technology, RBC systems are commercially available to handle both industrial and domestic liquid organic wastes. Packaged mobile RBC systems have also been used to treat municipal landfill leachates. (Also see Activated Sludge, and Biological Treatment.)

Roughing Filter

See Trickling Filter.

Route of Exposure

Method by which the chemical is introduced into the biological organism (e.g., inhalation, ingestion, skin absorption, etc.).

rtec

See Mercury.

Rubber Solvent

See Naphtha.

Run-off

Means the portion of precipitation that drains over land as surface flow. Also may refer to the top overflow from a weir.

S

S

See Sulphur.

Safe

Condition of exposure under which there is a "practical certainty" that no harm will result in exposed individuals.

Safety Factor

Refers to adjustments to the experimentally-observed results (NOEL, NOAEL, LOEL or LOAEL values) to compensate for uncertainties in the test data as well as for imprecision in the extrapolation of the results to the general human population. (Also see Adjusted Margin of Safety.)

Safety Solvent

See Naphtha.

Salt

An inorganic chemical compound derived from an acid by replacing hydrogen, wholly or partly, with a metal or cation. Common salts include sodium chloride (table salt) and calcium chloride.

Salt Caverns

See Underground Storage.

Salt Mine Disposal

Disposal of wastes by long-term storage (usually in containers) in a decommissioned salt mine. (See Underground Storage.)

Sanitary Landfill

A method of disposing of nonhazardous refuse on land without creating nuisances or hazards to public health and safety. (Also see Landfilling (Municipal).)

Santobrite

See Pentachlorophenol.

Santophen 20

See Pentachlorophenol.

Saturated

The condition in which all voids, empty spaces or interstices of a material are filled with a liquid; or the state of a solution when it holds the maximum equilibrium or balanced quantity of dissolved matter at a given temperature.

Sb

See Antimony.

SCC

See Secondary Combustion Chamber.

Scrubber

See Electrostatic Precipitator, Scrubbing System, and Wet Scrubber.

Scrubber Blowdown

The effluent from the wet scrubber, including particulates removed in the scrubbing process.

Scrubber Effluent

The portion of the water or solution in the wet scrubber component of the flue gas treatment system which is discharged in order to maintain the concentration of dissolved solids at predetermined levels. In the case of the proposed OWMC incinerator, this same scrubber effluent becomes spray dryer feed.

Scrubbing

The removal of particulates and acid gases from a gas stream (usually of combustion gases) by passing it through a spray of water and/or neutralizing chemicals. (Also see Electrostatic Precipitator (Dry), Electrostatic Precipitator (Wet), Electrostatic Precipitator (ESP), and Wet Scrubber.)

Scrubbing System

An air pollution control device used to remove acid gases (e.g., sulphur dioxide and hydrogen chloride) and particulate before the air emission is released from the stack. It is also referred to as a scrubber.

Se

See Selenium.

Sea Salt

See Sodium Chloride.

Secondary Combustion Chamber (SCC)

The second component of an incineration system where complete combustion of organics in the flue gas and fly ash particles is achieved by maintaining an elevated operating temperature for a sufficient length of time and by thoroughly mixing additional combustion air with the flue gas. (Also see Afterburner and Primary Combustion Chamber.)

Secondary Propyl Alcohol

See Isopropyl Alcohol.

Secondary Treatment

Refers to secondary physical/chemical treatment processes that are aimed at reducing contaminant levels in the liquid phase of the waste to the maximum extent possible in preparation for final effluent polishing. Chemical oxidation, precipitation, coagulation and sludge dewatering are examples of secondary treatment processes. (Also see Primary and Tertiary Treatment.)

Secondary Waste

Wastes generated as a result of processing wastes (i.e. residues resulting from a waste recycling operation).

Secure Chemical Landfill

See Landfilling (Secure Chemical).

Sedimentation/Precipitation

Description: Sedimentation is a purely physical process whereby suspended particles having a different specific gravity settle out of a liquid. Sedimentation may also be used for the phase separation of one liquid from another (for example, oil from water). Precipitation is a physical-chemical process whereby some or all of a substance in solution is transformed into a solid phase that may be settled or filtered out. Chemical agents may be added and/or the pH adjusted to force specific dissolved substances to precipitate from an aqueous waste stream.
Wastes Handled: Any aqueous stream containing a suspended/precipitable component.
Availability: Most industrial wastewater containing suspended pollutants employ sedimentation/precipitation systems. (Also see Chemical Precipitation, Flocculation, and Precipitation.)

Segregation of Waste Streams

Refers to keeping the various waste streams produced by a plant's manufacturing processes separate to facilitate their treatment, recycling and/or disposal.

Selective Catalytic Reduction (SCR)

A technology specifically developed for the post-combustion removal of nitrogen oxides (NO_X) from the flue gases of combustion systems.

Selen

See Selenium.

Selenium

Formula: Se
Synonyms: selen
Description: nonmetallic element exists in three forms: an amorphous red powder (which become black on standing), a grey form and red crystals; emits toxic fumes when heated to decomposition; incompatible with strong oxidizing agents; common compounds include selenium hexafluoride (a gaseous electric insulator), selenium sulphide (dandruff shampoos), hydrogen selenide (electronics), and selenium dioxide (oxidizing agent)
Uses: used in electronic equipment (TV cameras, photocells, solar batteries, computer cores, etc.); also used in ceramics (as a colourant), steel and copper, as a rubber accelerator, and a catalyst; trace element in animal feeds; used in medicine
Health Hazards: while elemental selenium is relatively nonirritating, a number of selenium compounds act as strong irritants to respiratory tract and eyes; may cause dermatitis, allergy rashes; long-term effects may include pallor, lassitude, irritability, indigestion, "garlic breath," and giddiness; an experimental carcinogen (though not confirmed in humans), causes kidney/liver damage in animals; may be linked to amyotrophic lateral sclerosis (ALS)

Selenium Dioxide

See Selenium.

Selenium Hexafluoride

See Selenium.

Selenium Sulphide

See Selenium.

Semi-Dry Scrubber NO_x Removal

A process aimed at the removal of nitrogen oxides (NO_X), in addition to the other gaseous, acidic contaminants, from combustion flue gas. It is achieved by relatively minor modifications (i.e. the addition of sodium hydroxide to the lime slurry reagent) to the conventional semi-dry scrubbing system.

Semipermeable Membrane

A barrier, usually thin, that permits passage of particles up to a certain size or of special nature. Often used to separate colloids from their suspending liquid, as in dialysis.

Sequencing Batch Reactor (SBR)

Description: A variation of the activated sludge process, the SBR system accomplishes the aerobic treatment, sedimentation and separation of the liquid and sludge components all in the same tank. This eliminates the need for separate clarifiers and sludge recycle pumps, and cuts energy costs. A decant system removes the clarified effluent which is usually sent for fine polishing (using an activated carbon or sand filter system). During the idle phase between loadings, the accumulated biomass feeds on itself to reduce the amount of sludge in the tank.

Wastes Handled: Used to treat dilute aqueous organic waste streams (both domestic and industrial). The operator can adjust the oxygen supply, nutrient and agitation conditions that favour the selective growth of those bacterial strains that can best treat a particular waste stream.

Availability: SBR systems are currently being used to treat hazardous wastes (primarily landfill leachates) at commercial facilities in the U.S. (Also see Activated Sludge, and Biological Treatment.)

Sevin

See Carbamates.

Sewer Surcharge

Additional sewer user rates set by governing bodies for over-strength discharges (i.e. the contaminant level is higher than normally allowed)..

Shallow Entombed Landfill

A landfill in which all of the treated material (in the case of the OWMC proposal, this would be solidified material) is placed below the base of the weathered zone.

Shell sol

See Naphtha.

Short-Term-Exposure-Limit (STEL)

A 15-minute time-weighted average exposure which should not be exceeded at any time during a workday even if the 8-hour time-weighted average is within the Threshold Limit Value (TLV). (Also see Emergency Exposure Limit (EEL), and Short-Term-Public-Limit.)

Short-Term-Public-Limit (STPL)

Limits applicable to predictable single exposures of short duration which, if not exceeded, are expected to be associated with, at most, a non-incapacitating, reversible effect. (Also see Emergency Exposure Limit (EEL), Short-Term-Exposure-Limit (STEL), and Threshold Limit Value (TLV).)

Significant Environmental Unit (SEU)

A SEU is an area of study/concern which is expected to be most susceptible to negative impacts. SEUs include Environmentally Sensitive/Significant Areas, Areas of Natural and Scientific Interest, and Areas of Important Biological Resources.

Site Clean-Up

The decontamination of a site initiated as the result of contamination. (Also see Clean-Up.)

Site-Specific Waste

A term used in the MOE 1983 "Blueprint" documents, to mean: (a) site-specific industrial waste; or (b) leachate sensitive waste; but does not include wastes subject to the provisions of Part VII of the *Ontario Environmental Protection Act* or to the *Ontario Water Resources Act*.

Slag

A solid product of combustion that exists in the rotary kiln in the molten state. It is composed of inert materials and other chemical elements that will not oxidize such as silica contained in soils or the steel from drums. The liquid slag is solidified by quenching in a water bath.

Slagging Incinerator

See High Temperature Slagging Incinerator.

Slaked Lime

See Calcium Oxide/Hydroxide.

Sludge

Semi-solid or liquid waste generated from a municipal, commercial, or industrial treatment facility, wastewater treatment plant, or air pollution control facility, exclusive of treated effluent from a wastewater treatment plant. (Also see Activated Sludge.)

Sludge Farming

See Land Treatment.

Sludge Spreading

See Land Treatment.

Slump Test

A laboratory procedure set out in Ontario Regulation 347 of the *Ontario Environmental Protection Act* designed to measure the cohesion of sludges. Material that slumps (i.e. does not retain its form) is classified as a liquid waste for purposes of waste management.

Slurry

A pumpable mixture of solids and liquids.

SNG

See Natural Gas.

Soda Lye

See Sodium Hydroxide.

Sodium Chlorate

Formula: $NaClO_3$
Synonyms: chlorate de sodium (Fr.), chlorate of soda, drop leaf, sodium salt of chloric acid
Description: odourless, colourless to yellow/orange crystals or liquid; soluble in water (sinks and mixes); not combustible, but a dangerous fire risk, contact with organic materials may start a fire; can release toxic chlorine gas when in contact with strong acids or when heated to decomposition; reacts with long list of metals and other compounds
Uses: used as an oxidizing agent and bleach (especially to make chlorine dioxide) for paper pulps; also used in ore processing, leather tanning and finishing, and chemical processing; herbicide and defoliant; matches, explosives and pyrotechnics.
Health Hazards: prolonged contact may result in irritation of mucous membranes, skin and eyes; inhalation may cause respiratory difficulties, sneezing and small nasal ulcers; ingestion of large amounts can be fatal

Sodium Chloride

Formula: NaCl
Synonyms: brine, common salt, halite, rock salt, sea salt, sodium monochloride, table salt
Description: colourless, odourless powder, crystals or lumps; soluble in water (sinks and mixes); not flammable, but releases toxic chlorine fumes when heated to decomposition; can react violently with lithium, and bromine trifluoride
Uses: used for snow and ice control; in the manufacture of soaps, sodium hydroxide, sodium bicarbonate, sodium chlorate, sodium chlorite, and chlorine; also used in pulp bleaching, food and fish processing (preserving and seasoning), photography, curing of hides, home water softeners, and mineral waters
Health Hazards: low health risk; slight irritation of nose (causing sneezing) and inflammation of the skin and eyes

Sodium Cyanide

See Cyanides.

Sodium Hydrate

See Sodium Hydroxide.

Sodium Hydroxide

Formula: NaOH
Synonyms: caustic soda, hydroxyde de sodium (Fr.), lye, soda lye, sodium hydrate, white caustic
Description: white anhydrous solid, flakes

or powder; or clear to white to slightly yellow, aqueous solution with no odour; soluble in water (sinks, dissolves and mixes), the anhydrous form in contact with water may generate sufficient heat to ignite combustibles; noncombustible, but generates explosive hydrogen gas when in contact with aluminum, tin, and zinc; reacts with acids, alcohol, metals, and a long list of organic chemicals
Uses: the most important commercial caustic, sodium hydroxide is used in the production of pulp and paper, alumina, synthetic detergents, laundry bleach, sodium salts, xanthates, rayon, cellulose film, industrial cleaners, textile processing, uranium mining, petroleum refining, surfactants, PF resins, refining vegetable oils, and the manufacturing of other chemicals
Health Hazards: a strong corrosive; dust or mist can damage the respiratory tract; contact can result in severe burning and deep ulcers on all exposed tissues and permanent eye damage

Sodium Hypochlorite

Formula: NaOCl-5HOH
Synonyms: antiformin, B-K liquid, Carrel-Dakin solution, chloros, chlorox, Dakin solution, hypochlorite, Javel water, liquid bleach
Description: usually encountered as a green to yellow, watery liquid with a bleach-like odour (pure sodium hypochlorite is an unstable powder); soluble in cold water (sinks and mixes), but decomposes in hot water; a strong oxidizing agent, a fire risk when in contact with organic material; reacts violently with amines, ammonium acetate, ammonium carbamate, ammonium nitrate, ammonium phosphate, cellulose, and ethyleneimine; anydrous salt is very explosive
Uses: used for bleaching paper, textiles, etc.; chemical processing; water purification, fungicides, swimming pool disinfectant, laundering agent, germicide, odour control and sanitation in food processing
Health Hazards: inhalation may result in inflammation and erosion of mucous membranes, coughing, pulmonary edema, and shock; contact may cause irritation, blistering and possible eczema

Sodium Monochloride

See Sodium Chloride.

Sodium Salt of Chloric Acid

See Sodium Chlorate.

Soil Dispersion

Dilution of substances dissolved in groundwater (solutes) in the porous media through which they flow. The solutes tend to spread out from the path they would be expected to follow based only on the groundwater flow path and velocity. This spreading phenomenon is known as hydrodynamic dispersion. It occurs because of mechanical mixing during flow through soil pores and because of molecular diffusion.

Sol B

See Naphtha.

Solidification/Stabilization

Description: Solidification/stabilization is a process used to immobilize the hazardous components in liquids, slurries, solid wastes, and contaminated soils. In simple terms, wastes are transformed into strong, stable rock-like materials (thereby improving the handling/physical characteristics of a waste, and/or limiting the leachability of hazardous constituents). Most solidification systems involve the addition of stabilizing and hardening agents, including: cement-based agents (such as Portland cements, flyash/cement kiln dust, soluble silicate-based compounds, etc.); lime-based pozzolanics; thermoplastics (including bitumen, paraffin, polyethylene); or organic polymers (urea-formaldehyde, unsaturated polyester, etc.). Stabilization can be performed in systems similar to those used for cement mixing (prior to the landfilling of the solidified wastes), or in-situ (stabilizing agents are blended into soils with mixing paddles and augers).

Wastes Handled: Solidification/stabilization is used to immobilize the residues and treated effluents from physical/chemical and thermal treatment processes, various inorganics, and contaminated soils. Most solidification processes are easily upset by organic levels over 10-20%.

Availability: Solidification/stabilization services are offered by several commercial firms. Mobile, on-site systems are also available. (Also see Encapsulation, Injection Grouting, In-Situ Chemical Treatment, and Vitrification.)

Solidified Mass

Landfill materials comprising solidified treated residues from the physical/chemical treatment and incineration plants.

Solidify

To treat wastes or residues with solidification additives and reagents to produce a solid block of material with high structural integrity. Contaminants in the waste or residue do not necessarily interact chemically with solidification reagents, sometimes they are mechanically locked within the solidified matrix. (See Solidification/Stabilization.)

Solid Waste

Solid waste is any garbage, refuse or sludge (which may include semi-solid or contained gaseous material) resulting from industrial, commercial, mining or agricultural operations or from community activities, which is discarded or is being accumulated, stored or physically, chemically or biologically treated prior to being discarded.

Solubility

The ability or tendency of one substance to dissolve uniformly with another. A solid or liquid may dissolve in another liquid, and a gas may dissolve in a liquid or other gas.

Solute

One or more substances dissolved in another substance, called the solvent; the solute is uniformly dispersed in the solvent in the form of molecules or ions.

Solution

A uniformly dispersed mixture of one or more substances (solutes) in one or more other substances (solvents).

Solvent

A substance capable of dissolving another substance (solute) to form a uniformly dispersed mixture (solution).

Solvent Extraction

See Liquid-Liquid Extraction.

Source Reduction

Any activity that reduces or eliminates the generation of wastes before they are produced within a process. (See Reduction.)

Special Wastes

Wastes from commercial or industrial companies which due to their nature, composition or quantities are deleterious to human health, or the environment or which are explosive, flammable, or may cause diseases. Previously equivalent to liquid industrial and hazardous waste in Ontario legislation. (See Hazardous Waste, and Waste.)

Spectracide

See Organophosphates.

Spirit of Hartshorn

See Ammonia.

Spirits

See Ethyl Alcohol.

Spirits of Salt

See Hydrochloric Acid.

Spirits of Turpentine
See Turpentine.

Spoil Piles
Piles of material removed from an excavation.

Spotlon
See Organophosphates.

Stabilization
Any process which converts a substance to a more chemically stable form. See Solidification/Stabilization.

Stabilization Pond
See Waste Stabilization Pond.

Stabilize
To limit the solubility or mobility of chemical component(s) in a waste material, with or without change or improvement in the physical characteristics of the waste.

Stack
The vertical structure that contains the cylindrical duct or flue used to convey and discharge the cleaned flue gases to atmosphere.

Standard Industrial Classification (SIC)
A nationally recognized two to four digit number developed by the U.S. Department of Commerce that classifies industries (thus 28 = "chemicals", 285 = "paints, varnishes, etc.") It is also used to categorize waste generators.

Stangard
See Pentachlorophenol.

Starved Air Combustion
See Pyrolysis.

Statistically Significant
When the difference between a predicted and an observed value (at a given level of significance or importance) is large enough that the original hypothesis or assumption is contradicted and thus rejected.

Steam Distillation
See Steam Stripping.

Steam Stripping
Description: Steam stripping employs fractional distillation to remove volatile organics from an aqueous waste stream. In this continuous process, preheated wastewater is introduced into the top of either a conventional distillation tower or a packed column, while steam is injected into the base. Volatile organics and gases are stripped from the wastewater in a counter-current action. The treated wastewaters may pass through a heat recovery unit. The contaminated effluent steam is condensed and further processed for product recovery or final discharge (some portion may be recycled back to the stripping tower). The process is energy intensive and, because steam is mixed with the waste stream, requires the treatment of large volumes of wastewater in the final polishing stages.
Wastes Handled: The process is used to remove contaminants (including phenols, hydrogen sulphide or ammonia) that have a higher concentration or lower volatility than those treated in air stripping units. It is also used to treat more variable wastes, including solids, that could clog evaporator units.
Availability: Steam stripping units are currently used to treat a variety of industrial waste streams. Mobile steam stripping systems are also available for treating contaminated soils and groundwaters on-site. (Also see Air Stripping, Ammonia Stripping, Distillation, and Evaporation.)

Step Aeration
See Activated Sludge.

Stibium
See Antimony.

Still Bottom

Tar-like material derived from distillation processes used in oil refining or product recovery.

Stink Gas

See Hydrogen Sulphide.

Stoddard Solvent

See Naphtha.

Stoichiometric

Refers to the quantitative relationship between the reactants and products in a chemical reaction.

Storage

The actual or intended containment of waste on a temporary basis, in a manner which does not constitute disposal.

Storage Tank

Any manufactured non-portable device used for containing pumpable material.

STP

Sewage Treatment Plant. (Also referred to as Water Pollution Control Plant.)

Styrene

Formula: $C_6H_5CH:CH_2$
Synonyms: cinnamene, cinnemenol, phenylethene, phenylethylene, styrol, vinylbenzene, vinylbenzol
Description: colourless liquid with a sweet odour at low levels (that grows disagreeable at higher concentrations); insoluble in water (floats); flammable, with flashback possible along vapour trails; readily undergoes polymerization (releasing heat and constituting an explosive threat) when heated, or exposed to light or a peroxide; reacts vigorously with oxidizers, and metal halides; may react violently with chlorosulphonic acid, oleum, and sulphuric acid; does not usually vapourize to dangerous levels
Uses: used in the production of plastic polystyrenes, resins, rubbers, polyesters, and protective coatings
Health Hazards: inhalation may cause irritation of the mucous membranes, difficulty breathing, coughing, fatigue, dizziness, impaired coordination, depression of the central nervous system, and loss of consciousness; may be absorbed across the skin (but not likely in toxic amounts); prolonged or repeated skin contact may cause mild irritation, and slow to heal corneal injury; long term exposure may affect motor function

Styrol

See Styrene.

Subchronic Exposure

Intermediate exposure period, generally ranging from approximately 2 days to 6 months. (Also see Acute Exposure, and Chronic Exposure.)

Substoichiometric

In the case of waste incineration, refers to less than a stoichiometric quantity of oxygen required for complete combustion.

Sulfur

See Sulphur.

Sulphides

Compounds of sulphur with elements or radicals.

Sulphur

Formula: S_8
Synonyms: bensulfoid, brimstone, colloidal-S, colsul, crystex, flowers of sulphur, sulfur, sulphur flour
Description: yellow powder, slates, granules or lumps (or a yellow to orange-red liquid); pure forms are odourless or may have a faint rotten-egg odour; insoluble in water (sinks, although fine powder may float); combustible, producing toxic sulphur dioxide; a spark may explode dust; may react

violently in contact with oxidizing agents, powdered metals, and a long list of other compounds

Uses: used in the pulp and paper industry, uranium ore processing, metal recovery, petroleum refining, and rubber vulcanization; as a binder and asphalt extender in road paving; used to make sulphuric acid, soaps, fertilizers and soil conditioners, plastics, drugs and pharmaceuticals, explosives, pesticides, detergents, dyes and chemicals,

Health Hazards: elemental sulphur is virtually non-toxic, although burning will produce dangerous gases; dust can irritate mucous membranes; smarting and reddening of the skin after prolonged contact

Sulphur Dioxide

Formula: SO_2

Synonyms: sulphurous acid anhydride, sulphurous anhydride

Description: colourless liquid or gas with a strong, pungent odour; soluble in water (liquid SO_2 sinks, but may react with water or steam to produce dangerous sulphurous acid fumes); not combustible, but an outstanding oxidizing/reducing agent; reacts violently with acrolein, aluminum chlorates, chromium, ferrous oxide, fluorine, manganese, potassium chlorate, sodium carbide, stannous oxide

Uses: used in the pulp and paper industry, metal refining/finishing, water treatment, food processing (as a chemical preservative or food additive), tanning, and the production of sulphuric acid, sodium sulphate and sulphite; disinfectant and fumigant; bleaching of beet sugar, flour, fruit, paper pulp, glues, grain, straw, textiles, wicker ware, wool, etc.; dangerous air pollutant and constituent of smog

Health Hazards: acutely toxic by inhalation; gas is extremely irritating, and may cause sore throat, coughing, shortness of breath, blurred vision, edema, respiratory paralysis; prolonged exposure may lead to bronchitis-like symptoms; contact with liquid form may cause frostbite or severe burns to skin and eyes; possible co-carcinogenic agent

Sulphureted Hydrogen

See Hydrogen Sulphide.

Sulphur Flour

See Sulphur.

Sulphur Hydride

See Hydrogen Sulphide.

Sulphuric Acid

Formula: H_2SO_4

Synonyms: acide sulphurique (Fr.), battery acid, dipping acid, fertilizer acid, hydrogen sulphate, oil of vitriol

Description: an oily, odourless liquid that is colourless to dark brown (depending on the purity); soluble in water (sinks and mixes, generating heat); not flammable, but emits highly toxic fumes when heated; very reactive, incompatible with water, organic materials and an enormous array of substances; flammable hydrogen gas can be formed on contact with metals; $H_2SO_4 + SO_3$ (known as disulphuric acid, fuming sulphuric acid, oleum, or pyrosulphuric acid) is a concentrated, even more reactive acid

Uses: widely used in the chemical world with many applications, including production of phosphoric acid, hydrofluoric acid, phosphate fertilizers, aluminum sulphate, ammonium sulphate, cellulose films, rayon, soaps and detergents, a number of organic chemicals, explosives and titanium dioxide; also used in uranium ore processing, mining and smelting, the pulp and paper industry, and petroleum refining.

Health Hazards: mists and vapours are very corrosive, causing damage to the upper respiratory tract and lungs, coughing and sneezing, bronchitis, emphysema, fibrosis, and chemical pneumontis; contact may also cause severe burns to the skin and eyes, dermatitis, and ulcers; chronic exposure may result in impaired lung function, and erosion/discolouration of teeth

Sulphurous Acid Anhydride

See Sulphur Dioxide.

Sulphurous Anhydride

See Sulphur Dioxide.

Sumithion

See Organophosphates.

Sump

A pit or well to receive and contain overflow water, oil or other liquid from a storage tank or equipment.

Superacide

See Organophosphates.

Supercritical Fluid Extraction/Oxidation

Description: This thermal process can be used to either recover (supercritical fluid extraction) or destroy (supercritical fluid oxidation) contaminants from aqueous streams or contaminated soils. At their critical temperature and pressure (the point where a liquid changes to a gas) certain fluids exhibit characteristics that enhance their solvent properties. Organics that are only slightly soluble in a certain solvent, such as water, become completely miscible under supercritical conditions. The entrapped organics can then be oxidized; under such conditions, water will react with organics to form low molecular weight products that can then be completely oxidized with a reactor residence time of less than two minutes. Or contaminants may be recovered through distillation; insoluble inorganics can also be removed.

Wastes Handled: A wide variety of organic compounds can be recovered or oxidized from liquid, semi-solid or hazardous solid wastes.

Availability: The system has been successfully demonstrated in bench and pilot-scale facilities. Several commercial models are available. (Also see Thermal Treatment, and Wet Air Oxidation.)

Supernatant

Liquid above settled solids.

Surface Impoundment

A facility or part of a facility which is a natural topographic depression, man-made excavation, or diked area formed primarily of earthen materials (although it may be lined with synthetic materials) which is designed to hold an accumulation of liquid wastes or wastes containing free liquids, and which is not an injection well. Examples of surface impoundments are holding, storage, settling, and aeration pits, ponds, and lagoons.

Surface Water

Water that collects on the surface of the land (e.g., a pond) or that flows exclusively across the surface of the land from a point of origin to the point of departure (e.g., rivers, streams, etc.). (Also see Aerated Lagoon, and Waste Stabilization Pond.)

Surficial

At or near the surface.

Surrogate Chemical

Chemical chosen to represent several contaminants in a waste feed. The surrogate chemical can be traced throughout the process and its degree of destruction/detoxification can be determined and applied to the chemical(s) it represents. (Also see Destruction and Removal Efficiency.)

Suspension

A liquid mixture where a solid substance is present in the liquid in an undissolved state.

Suspension Freezing

Description: Suspension freezing, or freeze dewatering, is based on the principle that the ice formed during the freezing process is substantially free of dissolved contaminants. Hazardous components become concentrated in the brine pockets which remain among the ice crystals, or below the surface as ice forms on an open pond. The liquid must then be treated further. Some installations that store sludges outside in ponds are able to benefit from reductions in sludge volumes as a result of natural freezing.

Wastes Handled: Suspension freezing is being used to promote particle agglomeration and faster settling in gelatinous, difficult to dewater sludges (such as alum sludge). Could be used to purify aqueous waste streams carrying dissolved solids or liquids.

Availability: Although not commercially available for full scale waste treatment applications, artificial freezing equipment has been specially designed for sludge dewatering. (Also see Freeze Drying.)

Swale

A marshy depression in a stretch of land. Also a shallow depression on land to carry away surface water.

Synergistic Effect

The cooperative action of separate parts or substances such that the total effect is greater than the sum of the effects of the parts/substances if each had acted independently.

Syn Gas

See Natural Gas.

Synthetic Liner

Synthetic liners are manufactured from synthetic polymers (such as polyethylene). For engineered landfills, where application of synthetic liners are necessary, the liner is often made of high density polyethylene (HDPE).

Synthetic Natural Gas

See Natural Gas.

Systemic Dose

The dose which various organs and/or systems of the body receive as a result of the absorption of a substance into the blood stream.

Systemic Effects

Effects observed at sites distant from the entry point of a chemical due to its absorption and distribution into the body.

Systox

See Organophosphates.

T

2,4,5-T
See Chorophenoxy Compounds.

Table Salt
See Sodium Chloride.

Tailings
Refuse from ore in a mining process.

Tank Farm
An area on the site of a waste treatment facility where storage tanks are located.

Tapered Aeration
See Activated Sludge.

Tar Oil
See Creosote.

TCDD
See Dioxins.

TDI
See Methyl Isocyanate.

TDS
Total Dissolved Solids.

TEL
See Tetraethyl Lead.

Temephos
See Organophosphates.

Temik
See Carbamates.

TEPP
See Organophosphates.

Teratogenic
Refers to a chemical or agent that causes physical defects in the developing embryo after maternal exposure to the chemical or agent.

Terbufoss
See Organophosphates.

Terebenthine
See Turpentine.

Tertiary Treatment
In municipal sewage treatment plants, tertiary treatment is the advanced cleansing of wastewater that goes beyond the secondary treatment stage and removes nutrients and most of the residual suspended solids. (Also see Primary and Secondary Treatment.)

2,3,7,8-Tetrachlorodibenzo-p-dioxin
See Dioxins.

Tetrachloroethene
See Perchloroethylene.

Tetrachloroethylene
See Perchloroethylene.

Tetrachloromethane
See Carbon Tetrachoride.

Tetraethyl Lead
Formula: $(C_2H_5)_4Pb$
Synonyms: anti-knock compound, TEL, tetraethylplumbane; also see Lead.
Description: oily liquid with a sweet, pleasant odour; colourless but commercial mixtures may be dyed red, orange or blue; will decompose in sunlight to form needle-like crystals with garlic odour; insoluble in water (sinks); combustible, fumes from fire may contain toxic lead compounds; can react vigorously with oxidizing materials
Uses: used in gasoline as an anti-knock agent (has been largely replaced by MBTE)

Health Hazards: powerful poison, causing acute intoxication of central nervous system (after either high dose or long exposure to low levels); inhalation may cause nose irritation, shivering, pallor, restlessness, insomnia, nightmares, delirium, convulsions, and death; can be readily absorbed across skin; contact may cause itching, inflammation and blisters; an experimental carcinogen

Tetraethylplumbane
See Tetraethyl Lead.

Tetrahydro Oxazine
See Morpholine.

THC
Total Hydrocarbons.

Theine
See Caffeine.

Thermal Capacity
The rating of incineration equipment in terms of heat released from combustion.

Thermal Destruction
Breaking down organic wastes by heating to high temperatures (cf. 1000°-1200° C) to convert the material to inorganic ash and gases such as carbon dioxide and sulphur dioxide. See Thermal Treatment.

Thermal Treatment
Processes that use heat to vaporize, oxidize or otherwise break down solid or liquid wastes. (Also see Advanced Electric Reactor, Advanced Oxygen Combustion, At-Sea Incineration, Calcination, Circulating Bed Combustion, Fluidized Bed Combustion, High Temperature Slagging Incinerator, Incineration, Infra-Red Incineration, Liquid Injection Incineration, Molten Glass Incineration, Molten Salt Incineration, Multiple Hearth, Plasma Arc Destruction, Pyrolysis, Rocking Kiln Incinerator, Rotary Kiln Incineration, Supercritical Fluid Oxidation, Vitrification, and Wet Air Oxidation.)

Thermocouple
A device used to measure temperature.

Thimet
See Organophosphates.

Thiodan
See Chlorinated Hydrocarbons.

Thiram
See Carbamates.

Thompson's Wood Fix
See Pentachlorophenol.

Three Rs (3Rs)
Reduction, reuse and recycling of waste; as distinct from the Four (4) Rs which includes waste recovery. (Also see Reduction, Reuse and Recycling.)

Threshold Dose
The dose that must be exceeded to produce an adverse response.

Threshold Limit Value (TLV)
Time-weighted average concentration for a normal 8-hour workday and a 40-hour work week, to which nearly all workers may be exposed repeatedly, day after day without adverse effect. (Also see Emergency Exposure Limit (EEL), Short-Term-Exposure-Limit (STEL), and Short-Term-Public-Limit.)

Tim-Ber-Lux
See Pentachlorophenol.

TOC
Total organic carbon.

Toluen
See Toluene.

Toluene

Formula: $C_6H_5CH_3$
Synonyms: methylbenzene, phenylmethane, toluen, toluol, toluolo
Description: clear, colourless, watery liquid with an aromatic, benzene-like odour; insoluble in water (floats); flammable, vapour forms explosive mixtures with air, and flashback may occur along vapour trails; can react vigorously with oxidizing materials, violently with (nitric and sulphuric acid), nitrogen tetroxide, and silver perchlorite
Uses: used in production of benzene, benzoic acid/phenol, detergents, explosives, dyes, medicines, perfumes, etc.; used as a solvent in the formulation of rubber cement, paints and coatings, inks, pesticides, and most oils, gums and resins; a component in gasoline, aviation fuel and high octane blending stock
Health Hazards: inhalation depresses central nervous system and may cause headache, slight drowsiness, nausea, and difficulty breathing; high levels may paralyze breathing centre and cause rapidly developing pulmonary edema; may be absorbed across skin to cause similar symptoms; prolonged exposure may cause skin and eye irritation

2,4-Toluene Diisocyanate

See Methyl Isocyanate.

Toluol, or Toluolo

See Toluene.

TOX

Total halogenated organics.

Toxaphene

See Chlorinated Hydrocarbons.

Toxic

Deleterious with respect to the effects produced by exposure to a chemical.

Toxic Equivalency Factor

Used to adjust the mass of various chemicals to reflect an assumed daily "acceptable" dose of 1 mg/kg/day. For non-carcinogens, the toxic equivalency factor is the reciprocal of the Acceptable Daily Intake (ADI). For carcinogens, it is the Unit Cancer Risk (UCR) divided by 1×10^{-6}.

Toxicology

The study of poisons, including their nature, effects, detection and methods of treatment.

Toxic Tonne Equivalent

Mass of contaminants multiplied by toxic equivalency factor.

Treatability Coefficients

A reflection of the efficiency of a waste treatment technology to treat a specific waste under a given set of conditions.

Treatability Testing

Bench-scale or pilot-scale testing of waste samples, prior to treatment of wastes, to determine the optimum treatment recipes and procedures.

Treated Effluents

Liquid effluent remaining after thorough treatment of waste.

Treated Flue Gases

Refers to the cleaned flue gases after they have been treated for the removal of contaminants. (See Flue Gas.)

Treated Residue

Residues (such as filter cakes, incinerator ash, solidified residues, etc.) which result from either physical/chemical treatment, incineration or solidification.

Treatment Train

The combination of equipment and hardware arranged in a sequential manner synonymous with treatment system.

Tremolite

See Asbestos.

Triallate
See Carbamates.

Triatomic Oxygen
See Ozone.

Trichlorofluoromethane
See Chlorofluorocarbons.

Trichloroform
See Chloroform.

Trichloromethane
See Chloroform.

Trickling Filter
Description: The trickling filter is a fixed-bed, biological treatment process. Wastewater trickles through a bed of rock, slats or other packing, on which aerobic microbial populations are attached, while air is bubbled up from below. Both two-stage and alternating double filtration configurations are common. Because contact time is relatively short, biodegradation and organic removal is not as great as achieved in other biological processes (such as activated sludge). Trickling filters may be used to pretreat wastewaters.
Wastes Handled: Used for the treatment of dilute organics in wastewaters with less than 1% suspended solids.
Availability: Commercially available and in wide use. (Also see Activated Sludge, and Biological Treatment.)

1,3,7-Trimethylxanthine
See Caffeine.

Trinitophenol
See Picric Acid.

Trithion
See Organophosphates.

Trivalent Chromium
See Chromium.

Tropotox
See Chorophenoxy Compounds.

TRS
Total Reduced Sulphur.

TSD
Treatment, Storage and Disposal.

$TSHiO_2$
Thermal stability at high or oxygen-rich level.

$TSLoO_2$
Thermal stability at low or oxygen-deficient level.

Turbidity
Measure of cloudiness of an aqueous solution.

Turpentine
Synonyms: gum spirits, gumthus, oil of turpentine, spirits of turpentine, terebenthine (Fr.), turps, wood turpentine
Description: produced from the resin of pine trees, the distillate (oil of turpentine) is a colourless, volatile liquid with a characteristic, unpleasant odour; insoluble in water (floats); moderate fire risk, emits acrid fumes when heat; reacts with oxidizers, reacts violently with calcium hypochlorite, chlorine, chromic anhydride, hexachloromelamine, stannic chloride, trichloromelamine
Uses: used as a chemical feedstock in the manufacture of polishes, camphor, cleaning materials, inks, putty, cutting and cleaning fluids, paint thinners, resins, degreasing solutions, insecticides, liniments and medications, and perfumes
Health Hazards: irritating to the eye, nose, throat; contact dermatitis and eczema is common; inhalation depresses central nervous system and may cause headache, anorexia, anxiety, excitement, mental confusion, and pneumonia; kidney and bladder damage

Turps
See Turpentine.

TVO
Total Volatile Organics.

Two-Train Incineration System
An incineration system consisting of two one-train systems, operating side by side.

U

U
See Uranium.

UCD Waste Category
A waste classification system designed at the University of California at Davis.

Ucon
See Chlorofluorocarbons.

Ultrafiltration
Description: Ultrafiltration uses a semipermeable membrane to separate dissolved organic and inorganic components from aqueous solutions. Pressure is used to obtain adequate flow rates through the membrane. The cleaned effluent water may be discharged, while the retained portion with its concentrated load of contaminants may be sent for recovery, treatment or disposal. Factors affecting performance include temperature, pH, concentration polarization, membrane compaction, fouling or scaling problems, and the presence of strong chemicals that may damage the membrane. Membranes may be arranged in flat, scrolled, straight tubular, and helical tubular configurations. Ultrafiltration membranes have a larger pore size than those used in reverse osmosis (RO membranes have a pore size ranging from 0.0001 to 0.001 micron, compared with ultrafiltration's 0.001 to 0.02 micron). Surfactants can be added to improve the removal efficiencies of lower molecular weight organics and heavy metals.

Wastes Handled: Ultrafiltration is used to treat aqueous colloids containing high molecular weight species and finely divided suspended solids. To prevent clogging, it is important to remove oils and suspended solids through pretreatment.

Availability: Commercially available, industrial waste treatment systems include recovery systems for fats and oils, electropaint, and proteins. Other applications, including mobile units, are under development. (Also see Dialysis, Electrodialysis, and Reverse Osmosis.)

Ultraviolet Oxidation

See Photolysis.

Uncontrolled Evaporative Water Cooling (Wet Bottom Quench Tower)

A process in which hot flue gases are cooled to their saturation temperature injection of a cooling liquid (e.g., water, scrubber blowdown or a combination of the two) only part of which is evaporated and that is injected or sprayed into the flue gas at a constant rate regardless of entering gas temperature.

Underground Storage

Description: The underground storage of containerized wastes in stable geological formations (such as abandoned salt, potash or gypsum mines, or newly constructed mines) isolates toxic materials from the surface and groundwater environments while allowing the possibility of future retrieval, recovery or destruction. Consideration must be given to siting, waste containerization, labelling, handling, security, occupational health safeguards, fire safety, and the segregation of incompatible materials.

Wastes Handled: Underground storage should be limited to those wastes for which no other feasible management option currently exists. No liquid or ignitable wastes are acceptable.

Availability: The mine storage of hazardous waste is being investigated extensively in North America (the deep rock isolation of high-level radioactive wastes is a topic of particular interest in Canada). Several hazardous waste storage facilities are currently operating in West Germany and Britain. Salt formations have also been used for the non-retrievable disposal of liquid industrial wastes in Ontario. (Also see Above-Ground Storage, Deep Well Disposal, Disposal, and Landfilling.)

Unit Cancer Risk (UCR)

Estimate of the incremental lifetime risk associated with each unit of exposure in the low exposure region. (Also see Toxic Equivalency Factor.)

Unslaked Lime

See Calcium Oxide.

Upflow Sludge-Blanket Digesters

See Anaerobic Digestion

Uranium

Formula: U

Description: a heavy, silvery-white metal; ductile and softer than steel.

Uses: used primarily as a fuel in nuclear reactors; uranium compounds may also be used in staining glass, colouring ceramics, enameling, photographic processes, medical treatments, detection systems, alloying steel, weapons systems, and as a catalyst for chemical reaction

Health Hazards: highly toxic substances; those soluble in body fluids have a higher toxicity, and may cause shortness of breath, coughing, nausea and vomiting, and skin burns; also affect the kidney, liver, lungs and blood; radiation burns and damage may include cancer of the lung, osetcosarcoma, and lymphoma

Urea

Formula: NH_2CONH_2

Synonyms: carbamide, carbamimidic acid, carbonyl diamide, carbonyl diamine

Description: white granules or clear liquid; odourless or faint ammonia-like odour; soluble (sinks and mixes); not combustible (although it decomposes at 133°C to ammonia gas and toxic NO_x fumes)

Uses: used in fertilizers (either directly or in

mixtures), animal feeds, and urea formaldehyde resins
Health Hazards: relatively nontoxic; causes redness/irritation of eyes; inhalation of dust may cause sore throat, coughing, shortness of breath

Utilities

Electricity, fuel, steam, water and pressurized air which are used in a process plant; also the facilities which produce them.

V

Vacuum Extraction

Description: Vacuum systems are used in-situ to extract volatile organic compounds from contaminated soils. Industrial blowers provide a vacuum which is applied to the soil through extraction wells (the collection pipes in these wells are perforated above the water table for sucking up the volatile gases). The captured vapours and liquids are separated, and sent to an activated carbon canister and emission control equipment for removal.
Wastes Handled: The system is used to recover volatile organics from soils.
Availability: The system uses readily available components. Commercial vacuum removal systems are on the market.

Valence

A whole number which represents the combining power of one element with others.

Vapour Extraction

See Vacuum Extraction.

Variable Throat Venturi Scrubber

A component of an incinerator flue gas scrubbing system in which an alkaline solution is injected through an adjustable opening (venturi) which maximizes contact area with the flue gas in the scrubber to enhance hydrogen chloride/hydrogen fluoride removal.

Varnish Makers Naphtha

See Naphtha.

Varsol

See Naphtha.

VC

See Vinyl Chloride.

VCM

See Vinyl Chloride.

Vinegar Acid

See Acetic Acid.

Vinylbenzene

See Styrene.

Vinylbenzol

See Styrene.

Vinyl Chloride

Formula: C_2H_3Cl
Synonyms: chloroethene, chloroethylene, chlorure de vinyle (Fr.), ethylene monchloride, monochloroethylene, VC, VCM, vinyl chloride monomer
Description: a compressed, colourless gas (easily liquefied) with a mild, sweet odour; slightly soluble in water (floats and boils); highly flammable and explosive (flashback may occur along vapour trail), burning releases hydrogen chloride gas; can react vigorously with oxidizing materials
Uses: used in the production of polyvinyl chloride (plastics) and trichloroethane (solvents)
Health Hazards: human carcinogen (causing liver cancer); can irritate (the eyes, nose, throat and lung), depress the central nervous system, and cause dizziness, difficulty breathing, headache, paralysis and death; contact with liquid may cause frostbite, dry skin; chronic exposure has been linked to neurological disorders, malignant melanoma, and liver, brain and nervous system cancers

Vinyl Chloride Monomer

See Vinyl Chloride.

Vinyl Cyanide

See Acrylonitrile.

Vinylethylene

See 1,3-Butadiene.

Viscosity

The internal resistance to flow exhibited by a fluid.

Vitrification

Description: This in-situ thermal solidification process, sometimes known as glassification, is used to destroy solid and liquid organic contaminants and convert the contaminated soil into a chemically-inert, stable glass. Electrodes are inserted on each side of the material to be fused and a conductive mixture (of flaked graphite and glass frit) is laid down on the surface between them to act as a starter for the melt. An electric current heats the buried wastes above the melting point of the surrounding soil (1,600°-2,000°C). As the zone of vitrification expands, it consumes the non-volatile elements and pyrolyzes the organic compounds. A negatively pressurized cover placed over the treatment area captures any combustion gases which are ducted to off-gas treatment equipment. An area approximately 8 meters on a side and 6-meters deep could be vitrified during one set-up, a process that would take 7-10 days to complete.
Wastes Handled: Vitrification has been used for the destruction of organics and the immobilization of inorganics (including high-level radioactive wastes) in contaminated soils, abandoned landfills, process sludges and tailings piles. It is appropriate for treating extremely hazardous materials; the obsidian-like glass produced effectively isolates the toxic residuals.
Availability: The process has been demonstrated in field-scale tests and mobile units are commercially available. (Also see Glassification, Pyrolysis, Thermal Treatment, and Solidification/Stabilization.)

Volatility

The tendency of a solid or liquid material to pass into the vapour state at a given temperature.

Volumetric Analysis
A method for determining the amount of a material present by employing measured volumes of a liquid of a known concentration.

VOST
Volatile Organic Sampling Train.

Vydate
See Carbamates.

W

Washwater
The water used in the clean-up of transport vehicles, facilities, equipment and spills.

Waste
According to the Environmental Protection Act, waste is defined to include only "ashes, garbage, refuse, domestic waste, industrial waste, or municipal refuse and other such wastes asare designated in the regulations." (Also see Hazardous Waste, Liquid Industrial Waste, and Special Waste.)

Waste Class
Wastes grouped according to significant chemical and/or physical characteristics.

Waste-Derived Fuel
Fuel or a fuel supplement produced from waste material used for burning in a combustion unit. (Also known as Refuse-Derived Fuel (RDF).)

Waste Exchange
Waste information clearinghouse where information on wastes is transferred from generators to potential end users. It operates on the principle that "one person's waste can be another's feedstock".

Waste Generator
A facility which generates waste.

Waste Heat Recovery Boiler — Convective Type
A boiler (i.e. steam generator) used to recover heat energy from the flue gases that would otherwise be lost or wasted up the stack and in which the principal mechanism of heat transfer is convection.

Waste Management

Generally refers to the system of collection, transportation, recycling, treatment and disposal or storage of waste. In some contexts, it refers to any activity carried out by a waste generator to reduce or alter the total amount of waste which would otherwise be discharged from a plant into a sewer or receiving water body or be sent off-site for treatment and disposal.

Waste Minimization

Options exercised to reduce waste before its generation (e.g., raw material substitution, process modification, source separation, recycling, etc.). Also see Three Rs, and Four Rs.

Waste Stabilization Pond

Description: Large, relatively shallow (0.6-1.2 meters-deep) ponds are used to biodegrade dilute organic wastes through the action of both aerobic and anaerobic organisms. Wind currents are responsible for mixing the wastewaters. Ponds are usually constructed to accommodate from 15 to 60 days of wastewater flow, and may be operated in a batch or continuous flow mode. A treatment system may consist of several ponds in either series or parallel arrangement. Sludge deposits must eventually be removed by dredging.

Wastes Handled: Lagoons can be used to treat the same range of wastes as activated sludge processes, although generally at lower concentrations.

Availability: Waste stabilization ponds are easy to construct and maintain and are in broad general usage. (Also see Aerated Lagoon, Activated Sludge, Anaerobic Digestion, and Surface Impoundment.)

Waste Transfer Station

A facility used for the purpose of collecting wastes which are then shipped to another site for recycling, treatment and/or disposal.

Water Balance

An accounting of the water inflow to, outflow from and storage of water in a system or plant. (Also see Material Balance.)

Waybill System

The system in Ontario for monitoring and reporting off-site shipments of regulated waste from 1977 to 1986. This system was replaced by the present manifest system in 1986.

Well

A driven, drilled, bored or dug excavation, with a depth greater than the largest surface dimension, generally of cylindrical form and often walled by some means to prevent the excavation from caving in. (Also see Borehole.)

Wet Air Oxidation

Description: In this exothermic thermal process, combustible material is oxidized by air or oxygen in the presence of liquid water to produce, mainly, carbon dioxide and water. A high pressure pump is used to pass the waste through a heat exchanger (which heats the incoming waste with effluent from the reactor) into the reactor where compressed air or oxygen is added. The heat-producing reaction is initiated under conditions of relatively low temperature (150°-300°C) and high pressure (to keep the water in its liquid phase). Catalysts may also be added to increase the destruction efficiency. The liquid effluent may require biological treatment to remove particulate and residual organics, while the off-gases are directed to an air pollution control system.

Wastes Handled: Any aqueous combustible material, including relatively dilute (1-20% oxidizable organics and inorganics) waste streams, can be oxidized in this equipment. Water may need to be added in order to dilute more concentrated waste slurries.

Availability: Wet air oxidation has been used for many years to partially oxidize sewage sludge and pulp mill effluent. A number of commercial units are available, including mobile systems. A vertical tube reactor uses the pressures found almost one mile below the earth's surface to maintain the reaction. (Also see Supercritical Fluid Extraction/ Oxidation, and Thermal Treatment.)

Wet Deposition
The washout of contaminants from the atmosphere through precipitation.

Wet Scrubber (Disposable Reagent)
A wet scrubber is an air pollution control device that can be used to remove both particulate and gaseous (e.g., acid gases) contaminants from a flue gas stream. In a wet scrubber the contaminant laden gas stream is cooled by moisture addition to saturation, the gas is intimately contacted by a scrubbing liquid to effect capture of the contaminants by the liquid and the now contaminant laden liquid is separated from the gas stream.

Wet Scrubber (Regenerable Reagent)
A wet scrubber to which additional process steps have been added to effect treatment of the scrubber blowdown such that reagent may be regenerated and reused.

WFNA
See Nitric Acid.

White Asbestos
See Asbestos.

White Caustic
See Sodium Hydroxide.

White Fuming Nitric Acid
See Nitric Acid.

White Oxide
See Arsenic.

White Phosphorus
See Phosphorus.

White Spirits
See Naphtha.

WHMIS
Workplace Hazardous Materials Information System.

Winylu Chlorek
See Vinyl Chloride.

Wood Alcohol
See Methanol.

Woodlife
See Pentachlorophenol.

Wood Spirit
See Methanol.

Wood Turpentine
See Turpentine.

WPCP
Water Pollution Control Plant.

X

Xylenes

Formula: $C_6H_4(CH_3)_2$
Synonyms: dimethylbenzen, ksylen, xylol, xiloli
Description: typically a mixture of three isomers (ortho-, meta-, para-); colourless liquid with sweet aromatic odour; flammable, moderately volatile; insoluble in water (floats); can react to oxidizing materials; stable
Uses: annual demand of 81.5 kilotonnes used for phthalic anhydride production, as a solvent (alkyd resins, lacquers, enamels, rubber cements), in aviation gasoline, and in protective coatings, inks, dyes, adhesives and cleaning fluids
Health Hazards: irritates eyes (redness, watering, repeated exposure may cause reversible damage) and skin; inhalation causes dizziness, coughing, nausea, fatigue, pulmonary edema, coma; reversible kidney and liver damage; anorexia; absorbed through skin

Xylol

See Xylenes.

Y

Yellow Phosphorus

See Phosphorus.

Z

Zero Liquid Discharge

Treatment of waste which results in total destruction, solidification or recycling, so that no liquid effluent is discharged to the environment.

Zetar

See Coal Tar.

Zinc and its Compounds

Formula: Zn

Synonyms: blue powder, granular zinc, zinc dust

Description: a metallic element, zinc is an odourless, shining white metal with a bluish-grey lustre, or a blue-black powder or dust; insoluble in water (sinks); not flammable, but emits highly toxic zinc fumes when heated; zinc foil will ignite in the presence of moisture, and dusts may form explosive mixtures in the air; will generate flammable hydrogen gas when in contact with acidic or alkali solutions; zinc dust reacts with acids and a long list of other compounds

Uses: used in alloys (brass, bronze, and die-casting alloys), galvanizing iron and other metals, electroplating, electrical fuses, auto parts, storage and dry cell batteries, fungicides, roofing and gutters, engravers plates, cable wrappings, and organ pipes

Health Hazards: a mild toxic, inhalation of zinc dust may cause coughing; however exposure to more dangerous zinc compounds (including zinc chloride, zinc chromate and zinc sulphate) may cause skin irritation and metal fume fever (symptoms are metallic taste in the mouth, weakness, aching, nausea and vomiting, coughing, thirst and dryness); zinc may also contain dangerous impurities, such as cadmium, arsenic and lead; some zinc salts (chromates and arsenates) are experimental carcinogens

Zinc Chloride

See Zinc.

Zinc Chromate

See Zinc.

Zinc Dust

See Zinc.

Zinc Sulphate

See Zinc.

Zineb

See Carbamates.

Zolone

See Organophosphates.

Zone of Influence

Maximum extent to which a facility will affect surface and groundwater quality.

Zone of Maximum Impingement (ZMI)

Zone of maximum expected concentration of emissions due to the incinerator. (Also see Maximum Point of Impingement.)

Zone Settling Velocity

The maximum rate at which agglomerated sludge particles or floc settle towards the bottom of a specified vessel under the influence of gravity.

Zone Refining

Description: Zone refining is a purification technique that relies on the differences in composition which occur during the cooling of a liquid to a crystallized solid.

Availability: Not commercially available as a waste treatment technology.

OWMC

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Management Corporation

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De Gestion Des Déchets

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